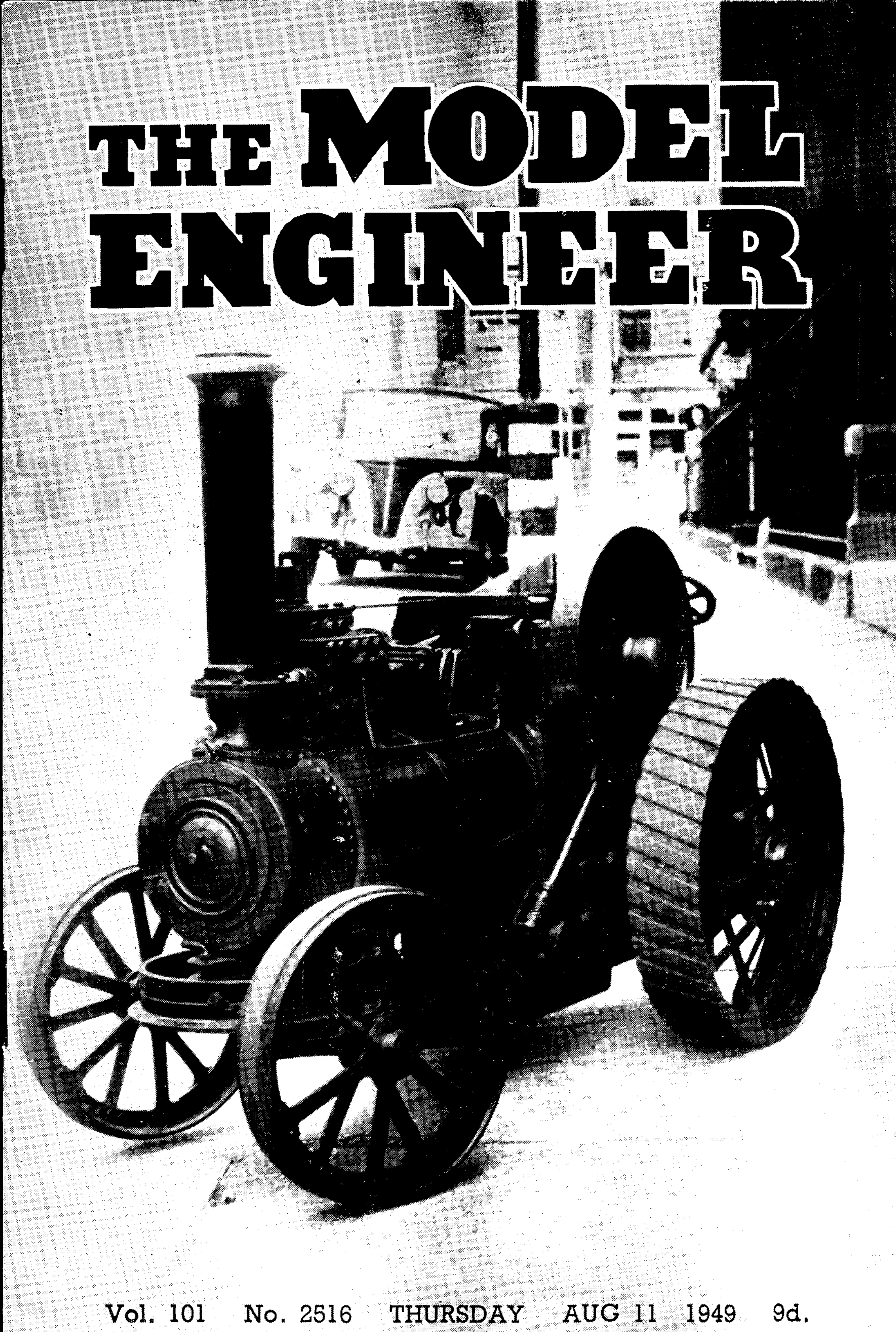
THE MODEL ENGINEER



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The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

11TH AUGUST 1949 VOL. 101 NO. 2516

SMOKE RINGS

Our Cover Picture

● WE HAVE chosen another photograph of our latest radio star as the subject for our cover picture this week. She is as glamourous as the best of them and—dare we mention it? *sotto voce*, of course—about as temperamental as most. But she responds well to proper management, as befits a fine lady of her standing! In other words, she is Mr. R. C. Hammett's 2-in. scale traction engine which was featured in "In Town Tonight" recently.

"M.E." Exhibition Opening

● THIS YEAR'S MODEL ENGINEER Exhibition will be opened at 12 noon on Wednesday next, August 17th, by Sir Frederick Handley Page.

Rapid Building of Model Locomotives

● THE ANNOUNCEMENT of the very ambitious attempt to construct a 5-in. gauge locomotive in the ten days of the "M.E." Exhibition by members of the Malden and District Society of Model Engineers, raises some points which are worth some careful consideration. Assuming that the materials and the workshop facilities are immediately available, the success of such a programme depends upon, first, a sufficient number of skilled operatives being able to give the necessary time to the task, and, secondly, upon the most careful planning and timing of the various processes involved. Obviously, the whole scheme must proceed with clock-like regularity, without a hitch of any kind; the loss of five minutes in any one of the early stages may well have a cumulative effect upon the future stages.

In spite of this, however, the attempt is to be made, and the public will be kept fully informed of the progress, by means of a blackboard upon which up-to-the-minute information will always be displayed. It is a most interesting and praiseworthy idea.

The Official Mind

● WE RECENTLY had occasion to consult an official dossier of photographs covering shipping, engineering and allied subjects. The photographs were well arranged in classified sections, and we found quite a good selection under "Ships" and also under "Locomotives." The "Engineering" section was disappointing to us, and there was nothing whatever under "Models." This last fact surprised us, but we thought that, while we were at it, we would just have a look under "Toys." Here was a real shock, for almost the first photograph we turned up was a splendid one of Bassett-Lowke's magnificent $\frac{1}{4}$-in. scale model of the R.M.S. *Queen Elizabeth*! Needless to say, the matter was pursued no further.

To Exhibition Reporters

● IT IS probable that this year, 1949, has established a record in the number of model engineering exhibitions held, or yet to be held in this country and overseas. Our mailbag seems to support this idea, and we could probably confirm it did our editorial duties permit us time in which to count up all the exhibition reports we have received and compare the total with those of other years. We are making no complaint about this ; on the contrary, we are glad to note the rising tide of interest in our hobby, since the first effect can only be to attract the support of more and more devotees. Therefore, we always welcome the receipt of exhibition reports from official representatives of the organisers.

But we feel we must offer, once more, some advice to the compilers of such reports. We know that these gentlemen must often have been shocked at what we have published, compared with what was sent in to us ; for the original reports were so obviously drawn up in the light of purely local interest, without a thought for what the majority of our readers might think about them.

And what can we say about the photographs sent to illustrate the reports ? There is much that we *could* say, but we will confine ourselves to pointing out the kinds of illustrations we do *not* want, assuming that, from the point of view of photographic technique, they are suitable for publication. They fall into three categories : (1) A shot of the Honorable Mrs. A. B. presenting the Society's Challenge Cup to Sam U. L. for his beautiful model of the *Whatsitsname* ; (2) a group of tiny toddlers clustered round, say a $7\frac{1}{4}$-in. gauge locomotive, and (3) a general view of the hall, in which much decoration in the form of flags and bunting, not to mention hanging aeroplanes, is usually prominently conspicuous while the exhibits take a secondary, tertiary, or even less significant place in the scene.

The models claim the first attention of our tens of thousands of readers, and we would be saved a lot of time, and the necessity for causing disappointment to club members, if reporters would, in future, see that the emphasis in their reports and illustrations is concentrated on the models, particularly any outstanding ones, and keep the reports as brief as possible.

Public Day at Longmoor

● ON SATURDAY, September 3rd, 1949, the Transportation Centre, R.E., at Longmoor (Hants) will be open to all visitors, from 1.30 p.m. Visitors will also be able to see displays of the various technical activities of the Centre covering the Military Railway, Port and Inland Waterway responsibilities of the Transportation Branch of the Corps of Royal Engineers, as well as some of the military side of the training of officers and men. All railway and port employees will be welcome, together with their families and friends.

The nearest British Railway stations are Liss and Bordon, whence military trains run to Longmoor Camp. British Railways will be announcing reduced fares for this day from stations within 60 miles of the Centre.

Public day will be followed by the unveiling and dedication of a stained glass window in the Garrison Church at Longmoor on Sunday morning, September 4th, 1949. This will form a memorial to the officers and men of the Movements and Transportation Branches of the Royal Engineers who lost their lives in the war.

A limited amount of accommodation is available at Longmoor for single men who wish to attend both functions and stay the night. Anyone interested should make early application to the H.Q. Transportation Centre, R.E., Longmoor Camp, Liss, Hants.

Inventors' Exhibition

● FROM SEPTEMBER 3rd until the 10th, the Society of Inventors, Birmingham Branch, will be holding its third annual exhibition in the Typographical Hall, Bath Street, Birmingham, 4. The hours of opening will be 10 a.m. till 8.30 p.m. daily.

The aims of the exhibition are : To encourage invention ; to assist the inventor to commercialise his invention ; to display manufacturers' prototype inventions, models and drawings ready for exploitation ; to introduce the manufacturer to the inventor ; to assist manufacturers to test public reaction to their new products, and to turn prototypes into products.

The exhibits cover a wide range, extending from mechanical, electrical, domestic and scientific devices to tools, working models and novelties, subject to approval by the committee.

Entry forms, which must be completed and returned by August 22nd are obtainable from Mr. B. Thornton Clarke, 244, Stoney Lane, Yardley, Birmingham.

Mr. R. Garden

● MR. L. J. FRENCH has written to inform us of the recent death of Mr. R. Garden, for many years president of the old South London Experimental and Power Boat Club, and known to older readers of THE MODEL ENGINEER as "Octogenarian." Mr. French writes :—

"It was my good fortune to know him for the last 25 years or more of his life, the greater part of which was spent in a brave and cheerful fight against ill-health, including several serious operations. I think it can be said that he was the first to demonstrate that flash-steam model boats could be made to perform in a manner superior to any others, and his *Minora* was a revelation to the model power boat fraternity in the 'twenties. A self-taught engineer, his interests were constantly being enlarged and his mental and manual ability were of a very high order. During the war, in his home workshop, he undertook work for my firm which made a substantial contribution to the national effort, successfully finding solutions to problems which had given our machine shop many hours of fruitless labour.

"He was one of the founders of the South London Experimental and Power Boat Club, and there will be many model engineers who remember him as one who was always willing to take the struggling beginner home and turn him up a new piston, or make him a pump which *would* pump, and before his illness, this good natured help came to take such proportions that his own model work remained unfinished.

WHAT TO SEE

AT THE 1949 "MODEL ENGINEER" EXHIBITION

The Models

SINCE this article is being written several weeks prior to the opening of the " M.E." Exhibition, nothing like a critical survey of the various exhibits is possible ; that wil have to wait until we have been able to inspect the models at close quarters.

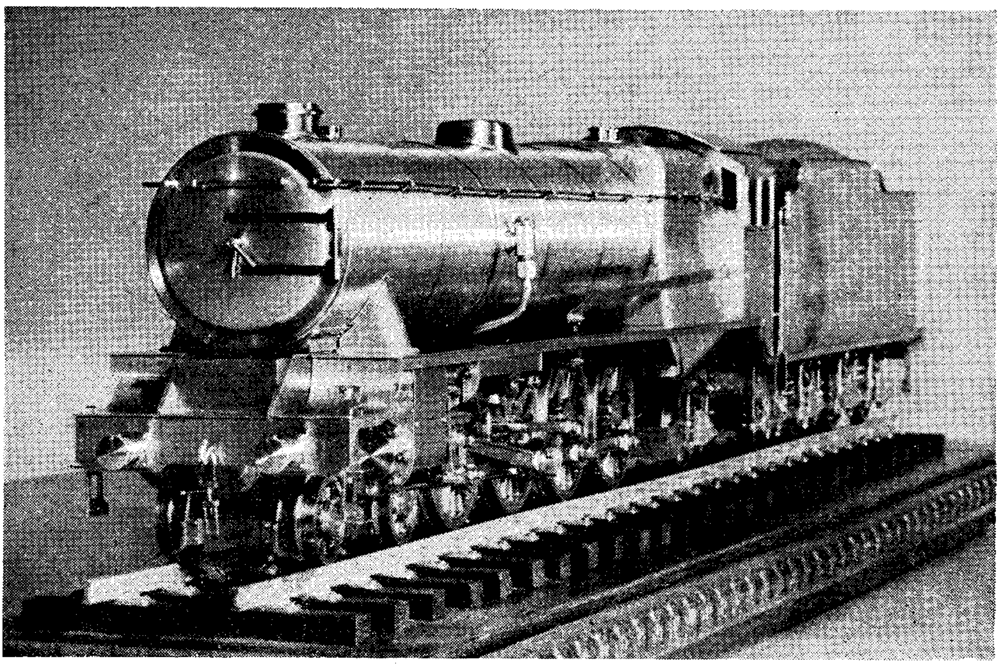
At the moment of writing, the Ship Section appears to be the most important, numerically ; but a glance through all the entry forms, covering every section and giving much useful information concerning each exhibit, indicates that the general workmanship is up to the usual standard.

Locomotives

Among these, the one which is more than likely to arouse the greatest interest is a " O "-gauge, 3-cylinder, 4-8-2 type steam-driven tender engine built by Mr. R. D. Rowell, of Shoreham-by-sea. Clearly, the workmanship in this model is of very high quality ; for the amount of detail included is very complete and well proportioned, as it must be if so small an engine is to function properly. Obviously, no matter what may be the qualifications of its builder, this model represents a most ambitious piece of work, and its photograph shows that it has, at least, reached completion, but is not painted—which is, perhaps, just as well in the circumstances !

Mr. V. E. Blyth, of Ilford, is responsible for a 1-in. scale edition of the ever-popular L.M.S. *Princess Royal.* This is another effort in the " big " class, as the overall length is 6 ft. 11 in., height 14 in. and width $10\frac{1}{4}$ in., while the weight is $3\frac{1}{4}$ cwt. It was built during service in the R.A.F., and was begun in 1942, finished in 1949, taking about 2,000 hours in all.

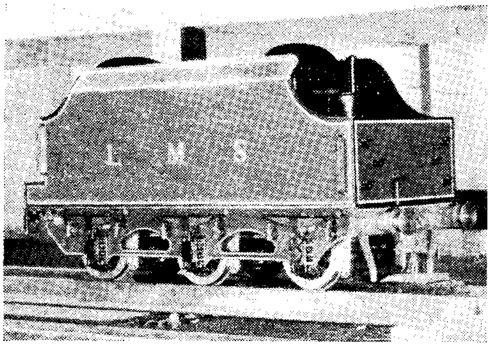
An interesting case of adaptation is being entered by Mr. A. C. Perryman, of Shoreham-by-Sea. It is a $3\frac{1}{2}$-in. gauge, 4-4-2 engine based on " L.B.S.C.'s " well-known *Maisie,* but



An " O "-gauge steam driven three-cylinder 4-8-2 locomotive built by Mr. Rowell, of Shoreham-by-Sea

modified to conform to Mr. D. E. Marsh's "H2" class for the old London Brighton and South Coast Railway. It was illustrated, partly finished, in THE MODEL ENGINEER for March 9th, 1944, but is now complete and capable of proving itself well on the track, as it has already done at Brighton and at Malden.

Mr. M. G. Baker, of Ashby-de-la-Zouch, will



Tender for Mr. Blyth's "Princess Royal"

be exhibiting a 2½-in. gauge G.W.R. *King George V*. This engine is, of course, coal-fired; it has four cylinders, inside Walschaerts valve-gear and a mechanical lubricator. Three years were required for its construction, but Mr. Baker's reward for this expenditure of time is an engine which will haul four adults on 2½-in. gauge.

Something of a novelty has been submitted by Mr. A. L. Clarke, of Faygate, Sussex. It is a 3½-in. gauge free-lance tank engine incorporating certain parts from "L.B.S.C.'s" locomotives; but it is fitted with a new kind of exhaust drain, operated from the cab, designed to prevent the escape of water and oil from the chimney when starting. The engine was built in spare time over a period of eight months.

The inevitable "first attempt at model engineering" comes, this year, from Mr. H. F. Hillyer, of Leatherhead; and it would certainly seem to be another ambitious effort, in that it is based on "L.B.S.C.'s" *Hielan' Lassie* and built for hard work, passenger carrying on 3½-in. gauge. Such parts as valve-gear, brake details, connecting-rods, certain cab fittings and the crank-axle are made of stainless-steel, and the whole model was completed in 2,500 hours of spare time. For a "first attempt," this represents good going!

Two saddle-tank engines figure in this section. One comes from Mr. J. F. Bruton, of London S.W.6, and is a 5-in. gauge, 0-4-0 engine weighing about 70 lb. The main interest about it is that it has been built expressly for passenger-hauling, and all its parts are, therefore, of ample size and strength; but great care has been bestowed upon its general proportions and appearance. The engine is equipped with an experimental unit whereby an initial pressure in the boiler, for steam-raising purposes, is obtained from a sparklet bulb.

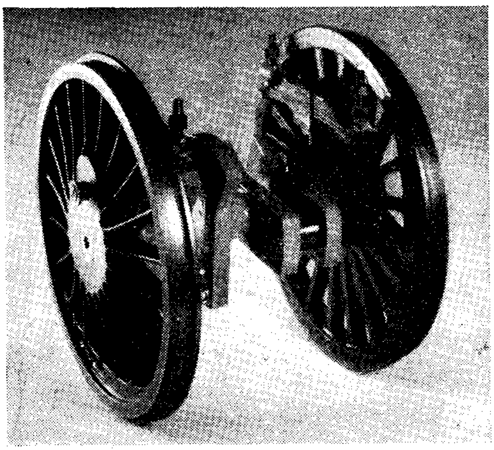
The other saddle-tank is also a 0-4-0, but for 3½-in. gauge, and is a further effort by Mr. M. G. Baker of Ashby-de-la-Zouch. It is fitted with an oil-fired, water-tube boiler, by way of a change.

A free-lance 4-6-2 type, 5-in. gauge passenger-hauling locomotive, designed and built by Mr. E. G. Rix, of Maidstone, is an imposing exhibit which is bound to attract a lot of attention. It was built over a period of seven years, in approximately 4,200 hours of "spare time." It is 7 ft. long and, in working order, weighs more than 3¾ cwt. The cylinders, of which there are two, have a bore of 1¾ in. and a stroke of 2½ in. The boiler pressure is 150-175 lb. per sq. in., and the boiler itself is of steel. Walschaerts valve-gear, steam brakes and safety air-brakes are included in its equipment. The engine is named *Liberty*.

A 3½-in. gauge L.N.E.R. 4-6-2 engine is another "first attempt" and was built by Mr. A. J. Webb, of Birmingham, who had not had previous experience in the use of a lathe. The time spent on the construction of this model amounted to 2,058 hours between May, 1947 and December, 1948. The result, however, seems to be thoroughly successful, because it has been awarded the Picknell Cup, in Birmingham, and has lapped the Campbell Green track, which is exactly 1/5 of a mile, in 52 seconds.

Traction Engines

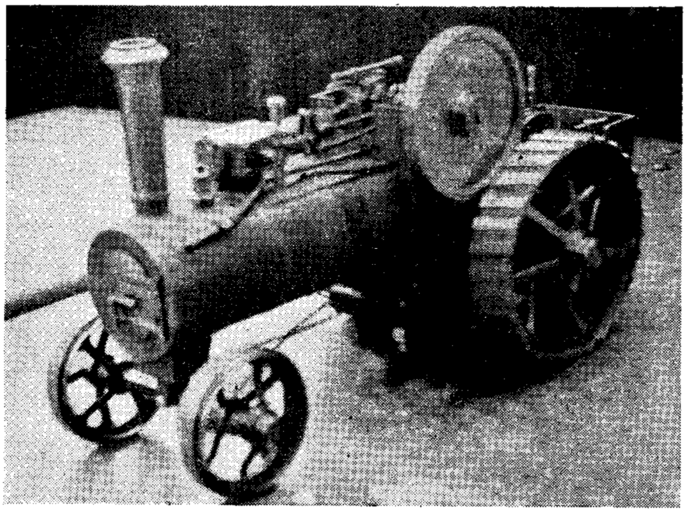
The number of traction engine models entered in the competition section is surprisingly few, in view of the prevailing amount of interest in the subject. Only four are recorded at the



Driving wheels and crank axle for Mr. Blyth's "Princess Royal"

time of writing these notes; but more are promised for the Loan Section, and most of these will probably be seen working during the course of the show.

Our old friend F. G. Bettles, of Taunton, will be represented by a fine 1½-in. scale Scenic Burrell Showman's engine in which every familiar detail will be faithfully present. Mr.



Mr. T Lloyd's traction engine

Bettles's work will be known to many of our readers, who will know just what to expect on this, his latest model.

Mr. T. A. Lloyd, of Banstead, is sending a Burrell-type traction engine built to ¾-in. scale, and having as many as possible of its parts fabricated. All the gears were cut on a home-made gear-cutting attachment, and this fact adds interest to the exhibit.

Mr. T. D. Walshaw, of Birkenhead, has considerably modified a Bassett-Lowke ¾-in. scale traction engine by re-designing the cylinder, valve-gear and motion-work. This is another "first attempt," apart from the building of an "HO"-gauge model railway, years ago.

Mr. E. W. Balson, of Southampton, is sending a 1½-in. scale Greenly compound traction engine, which appears to be quite a straightforward job without modifications or embellishments.

Scenic and Representational Models

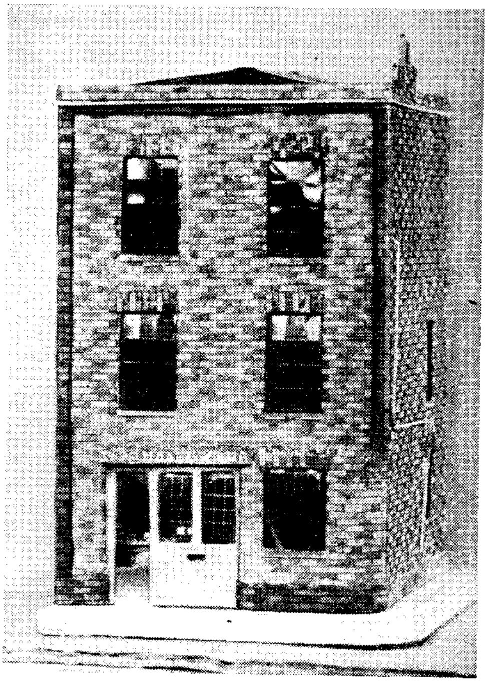
Among these, there are a few which are out-of-the-ordinary, and one of the most interesting is the work of a lady, Mrs. T. E. Butler, of Ramsgate; incidentally, it is her first attempt at model making. The subject is a condemned house, represented to 4-mm. scale. The prototype has had its ground floor repaired and fitted up as a workshop and meeting-room by members of the Ramsgate and District Model Club. All this is represented by Mrs. Butler who has fabricated such things as small lathes out of old spectacle frames; woodwork is in balsa, and the lamp-globe is half a pearl bead.

Mr. W. Stables, of Ulverstone, has set himself the task of building a model fair, in the old style and to 1-in. scale. His exhibit is the first part of this elaborate model and consists of a set of steam, three-abreast galloping horses and cockerels, all hand-made and painted. It is quite a spectacular piece of work that has taken about five years to complete.

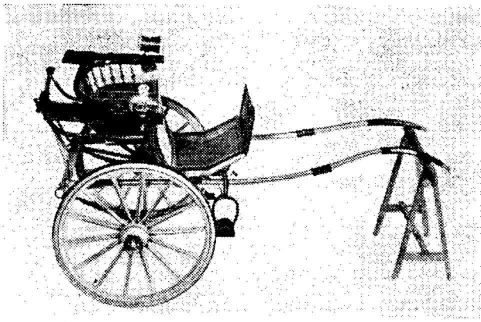
Mr. F. E. Bailey, of Thornton Heath, displays ingenuity with his ½-in. scale Home Office Escape Carrying Unit. It is built in three parts; the road vehicle, the fire escape and the Coventry Climax fire-pump. The pump gauge-glasses are sapphire bearings taken from old clocks; the road wheels are made of slate, and the mudguards were cut from old door-knobs!

Mr. N. E. Jenkinson, of Sheffield, has entered a model of Derwent Hall, Derbyshire, a 17th-century mansion which was demolished when the valley in which it stood was flooded to make the gigantic Lady Bower Reservoir.

Another architectural model will be the 1/72-scale reproduction of The Cloth Hall, Biddenden, Kent, made by Mr. G. Clasby, of Brighton. This model is fully oak-beamed, has proper plaster panelling between beams and is fitted with interior lighting. It is typical of many Flemish weavers' houses in the Kentish Weald, has taken about 500 hours to make and has approximately 12,000 tiles in the roof. The general effect is very pleasing, and we think the model will attract a lot of attention.



Mrs. T. Butler's model of Ramsgate Model Engineering Society's headquarters



Mr. P. Winton's miniature Tilbury gig

Mr. Roy Williams, of Ashford, Middlesex, is 72 years of age, and has just taken up model making! He is sending in two exhibits, an old-time coach, which is his first model, and a fire-engine which is his second. These will be interesting, in view of the circumstances in which they were made.

Mr. Peter Winton, of Wembley, is another elderly enthusiast; he is 75 years of age and he is submitting three delightful exhibits which could scarcely fail to arrest attention. One is a 3-in. scale replica of a hansom-cab, while the other two are 2-in. scale gigs. These are finished in the styles characteristic of their period.

A most unusual, but extremely effective entry comes from Mr. C. H. Hackwill, of Newbury, in the form of a spray of roses worked up in copper. This exhibit merits the closest inspection, not only on account of its intrinsic attractiveness, but because of the extraordinary accuracy of its details.

Another pleasing flash-back into the past comes from Mr. F. D. Mallett, of Epsom, whose five examples of 17th- and 18th-century furniture command close attention. They are, respectively: a Cromwellian gate-leg table, one armchair and two single chairs of the Lancashire spindle-back kind, and an Irish spinning-wheel, all made 1/5 of full size. The accuracy of the detail-work in these things is elusive, and it well repays the closest examination.

A very striking exhibit is a lathe-made challenge-cup by Mr. R. Johnston of Glasgow. It is made of brass, and is in two parts, a short threaded portion, integral with the bowl, screwing into a tapped hole in the stem. The castings were home-made, and all machining of them was done on a 5-in. lathe, the handles being afterwards silver-soldered to the bowl. When all was finished, the whole lot was chromium-plated, the result being a very handsome little cup, 6 in. high, 6 in. across and weighing 28 oz.

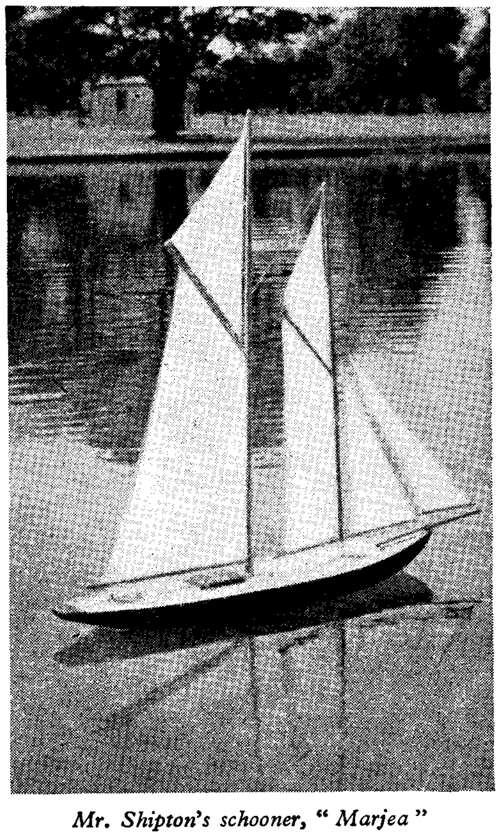
Recollections of the war are revived by the 1/40th-scale model of a *Matilda* Mark IIa camouflaged tank. It is 6½ in. long, 3¼ in. high and 3 in. wide, while its weight is 7 oz.

Mr. S. A. Walter, of Wembley, is the constructor of a very complete 1½-in. scale replica of a Leyland "Cub" fire-engine, type FK-6 of 1936, with extending Bayley sliding-carriage escape and representative equipment. Nearly 2,100 hours were spent in its construction, and it was built round a set of "ashtray" tyres bought at Woolworths in 1935. Patterns required for the few castings used were made by Mr. Walter.

Ship Models

The Ship Model Section, usually one of the most important features of the "M.E." Exhibition, promises this year to be of more than ordinary interest. The number of entries is well above that of last year's Exhibition, and last year's was a record in this respect. The quality of the exhibits as a whole seems to be improving, although, so far as we can judge from the models we have already seen, and from the entry forms, there is no really outstanding model this year.

It is always interesting to speculate on the reason for these developments. As to the increasing interest in ship-modelling, the two wars may have had their effect. In each case, thousands of men joined the Navy who would otherwise never have thought of doing so. Thousands more sailed overseas, many of them in liners, others in cross-channel packets, and so gained a knowledge of ships which would not have come their way under ordinary circumstances. It was inevitable that some among these thousands would find an interest in ships and be inspired with a desire to make models of

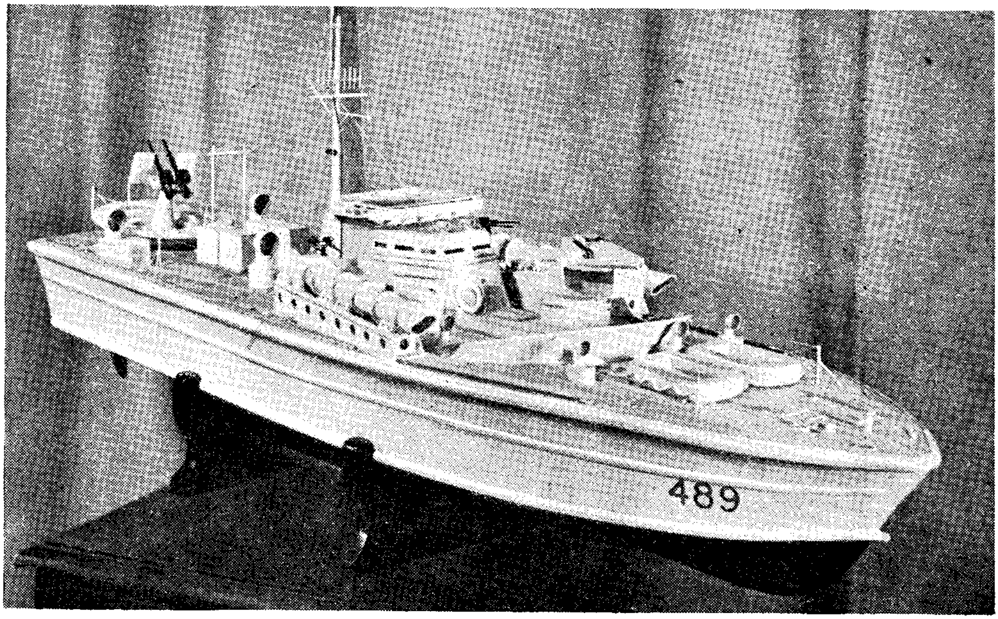


Mr. Shipton's schooner, "Marjea"

them. Another effect of the wars, and this affects the general public as well as those in the services, has been to make us feel our dependence on and to take a greater interest in our Merchant Navy. This has caused some of us to study the many types of ships engaged in the general transport of the nation. Among these types are to be found an endless variety so that, whatever the interest or the capacity of the would-be modeller, some prototype can be found exactly suited to his purpose.

As for the general improvement in the quality of the models, this is no doubt due in part to the greater knowledge of ships which has been acquired by actual contact with them. In the old days, many a model was made from a photograph or a painting which caught the fancy of the modeller. The model made as the souvenir of a ship on which one has actually sailed must obviously be more complete and more accurate in its details. Then again, a great mass of reliable information on ships is being accumulated and made available to those interested. New books and designs are being published and the libraries and museums are doing more than ever before to meet the needs of the model-maker and the research worker. The Ship Model Clubs with their meetings and discussions on ships generally, their local exhibitions and their demonstrations of the various methods and processes in model making, have done much to improve the standard of model-making.

But to get back to the Exhibition itself. It is impossible at this stage to give an accurate idea of the models which will be on view, but we can say something about those we have seen, and from our knowledge of the competitors we know what to expect from an examination of the entry forms. The earliest period represented by the models is that shown by the Nile Boat of the XVIII Dynasty, which has been entered by the Rev. A. Everall of Sheffield. This model has entailed a considerable amount of careful research and will be found worthy of close study. There are a number of models of the 16th and 17th centuries. Sometimes these are decorations rather than ship models, but occasionally one meets a model which is really worthy of consideration.



A model M.T.B. by Mr. B. E. Cook, of Hemel Hempstead

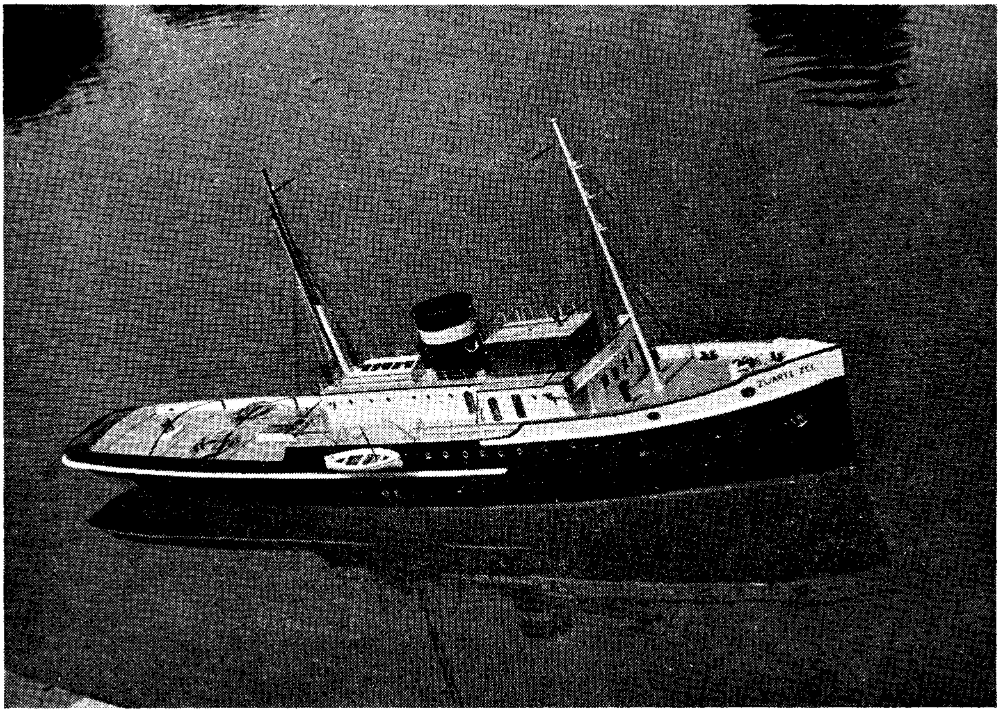
A case in point is the Spanish carrack by Mr. A. E. Field of Walsall. This is planked in frames and is a careful replica of the large *Santa Maria* model in the Science Museum, S. Kensington. Owing to the discrepancies between the model and what has since come to light about the *Santa Maria*, Mr. Field prefers to call his model simply "A Spanish Carrack." A photograph of Mr. Field's model in its early stages was published before the war in *Ships and Ship Models*. Mr. D. McNarry, who has won both the Championship Cup and a silver medal for his miniatures, sends a model of *The Golden Hind*, which should be worth noticing. It is accompanied by a *Cutty Sark*, both to his scale of 50 ft-1 in. and we look forward to seeing both models. There is another *Golden Hind* and two 16th century galleons, all built to the scale of $\frac{1}{4}$ in.-1 ft. This scale enables interesting deck fittings to be included and calls for careful detail work in the rigging. Other models of this period include a *Santa Maria*, by Mr. B. A. Howard of Bermondsey, a *Revenge* by Mr. W. F. Cross of Highbury, and *D'Healve Maen* by Mr. B. A. Mason of Chigwell, Essex. The latter model is

to the scale of 5 ft. 1 in. which gives possibilities of interesting details.

A model that will catch the eye is that of a galleon by Sgt. G. R. Day of Coulsdon, Surrey. The hull is built entirely of matchsticks, some 5,750 or so being used in its construction, which occupied six years of its builder's spare time. Mr. Chapman of Croydon sends a model of the *Mayflower* made entirely in copper. We have seen some beautiful models of old-time ships in both silver and copper. A good model of this type of ship in metal calls for specialised craftsmanship of a very high order. Another entrant, Mr. G. R. Webb, has based his model on the galleon shown on the halfpenny—which gives us a chance to check its accuracy.

The *Prince* of 1670, belonging, as it does, to one of the most ornate periods in the history of the ship, has always had an attraction for the model-maker, although neglect of the necessary research work can produce the most deplorable results. Mr. J. E. Longhurst has entered his model of the *Prince*, and we will be interested to see how he has tackled the subject. The scale is ⅛ in.-1 ft., which gives a model of very nice size with scope for good detail work. Two models of the *Endeavour* bark have been entered, one by Mr. C. Gillard of Balham, and one by Mr. J. N. Hampton of the Surbiton Club. We have seen and admired Mr. Hampton's model, and from what we know of Mr. Gillard's work, his model also should be worthy of careful examination.

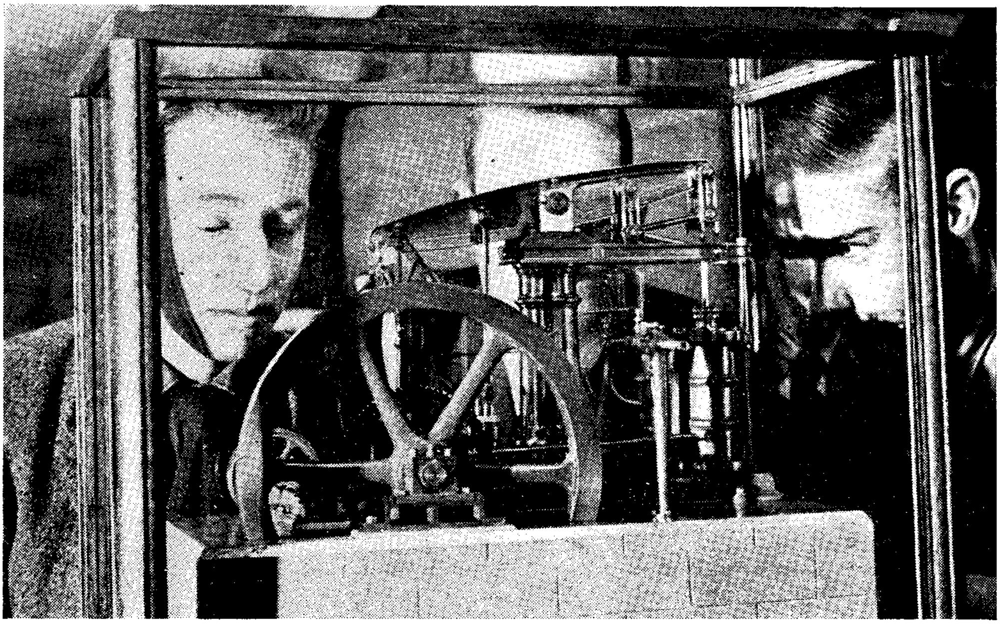
Mr. T. W. Karran of Harrow has entered his fine model of a topsail schooner of 1780. This was illustrated in *Model Ships and Power Boats* last January, and is a fine piece of work. Mr. Karran also sends a free-lance model of a sailing ship which should be an interesting exhibit. A notable exhibit is the model of a 32-gun frigate of approx. 1810, made by Captain J. T. Shenton R.N. (Retd.) of Bodmin, Cornwall. This is to the scale of ⅛ in.-1 ft. and, being made from contemporary drawings, is a valuable record of that type of ship. The rigging is especially worthy of note as Captain Shenton served in the Navy in the last days of square rigged ships, one of his ships being H.M.S. *Monarch* of 1869. This model was illustrated in *Model Ships and Power Boats* for May of last year. Incidentally, Captain Shenton is probably the oldest competitor in the Exhibition being now about 88 years of age. He still builds models and is hoping to visit the Exhibition again this year. His model of a 74-gun ship was awarded a bronze medal in last year's Exhibition. A Revenue cutter of 1800 by Mr. Lidderdale-Forrest of Ewell, Surrey, brings us to the 19th century. Lack of space prevents us, at present, from describing more of the models which will be on view, but we hope to continue next week with a description of more of the models so that our readers will have some idea of what to look for when the Exhibition is actually opened to the public.



Mr. W. Morris's model of ocean-going tug " Zwarte Zee "

General Engineering Models

Several examples of designs which have featured in past volumes of THE MODEL ENGINEER have been entered in this section. It is interesting to see a revival of the popular MODEL ENGINEER beam engine which first appeared in 1914, in this case entered by Mr. R. A. Barker of Sheffield. The scale of the model has been reduced to $\frac{3}{4}$ in. to the ft., but in other respects, the details of



A reduced scale " M.E." beam engine, by Mr. A. J. Barker

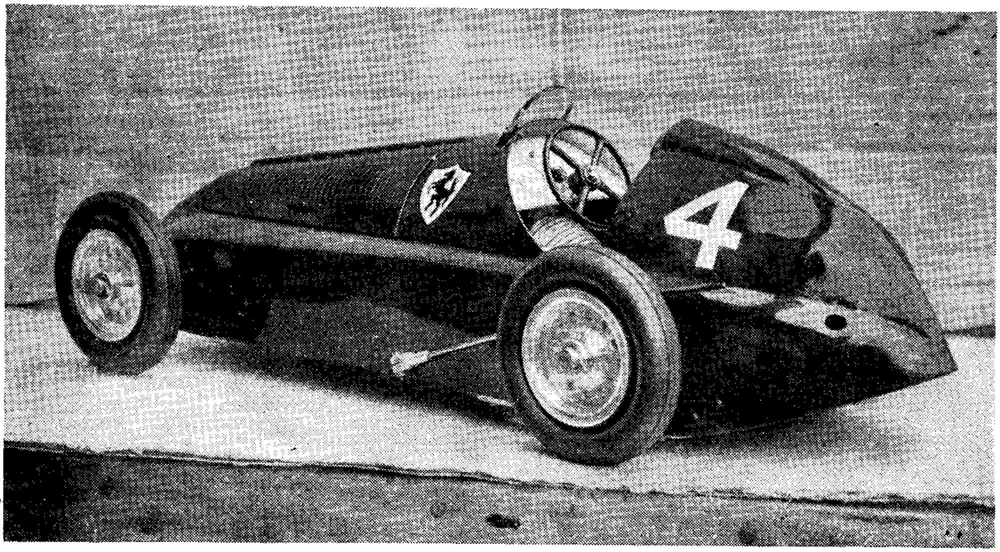
the original design have been faithfully followed. Most of the components of the engine are made from iron castings but the beam, which incorporates a good deal of fine work, has been fabricated from steel. For the benefit of those readers who are not familiar with this design, it may be mentioned that this is a type of engine which was extremely popular in the early and middle periods of the last century, and was used extensively for pumping, winding and mill machinery. It is said by the constructor that somewhat similar engines, built as early as 1825, are still in constant daily use in Derbyshire.

Some good examples of team-work in model engine construction are exhibited by Messrs. F. H. Tapper, A. J. Kent and F. Moulson, who have largely been responsible for the construction of a semi-portable steam engine of 1-in. scale, based mainly on Marshall practice on similar lines to the design published in THE MODEL ENGINEER in 1912. This has a coal-fired boiler, brazed throughout, water-tested to 250 lb. per sq. in. and steam-tested to 150 lb. per sq. in. The feed water is heated by passing a portion of the exhaust steam through a perforated pipe in the feed water tank. A steam-jacketed cylinder is fitted, and the boiler is lagged with asbestos covered with a thin felt jacket and cleaded with brass lagging sheet. A gib and cotter type of connecting rod big end bearing is fitted, the pump and eccentric rods being bronze thrust pads with cotter adjustment. For boiler filling and emergency use, a hand-pump of " L.B.S.C." pattern is concealed in the water tank. All fittings and studs, and a large proportion of the nuts, were made by the exhibitors, and the castings were obtained from patterns made by Mr. Moulton. In order to ensure accurate alignment of the motion work, a special jig was made, having a circular portion the same diameter as the boiler, with a flat on the underside, machined parallel to the axis for location on a surface plate. With the aid of this jig, the cylinder, spectacle plate and bearing saddle were marked out, and main bearing housings machined in position, ensuring extreme accuracy when the motion was transferred to its seating on the boiler.

Messrs. Tapper and Kent are also responsible for two other very interesting steam engine models, one of which is the Tangye mill engine of the period about 1870. This was modelled with the aid of the original drawings loaned by Messrs. Tangyes, in conjunction with photographs and sketches of an engine of this type still in service driving a dynamo at Coombs Wood Colliery, Halesowen. The structural parts of the engine are fabricated by silver soldering, pinning and sweating. The flywheel is made from a steel disc and all other parts are machined from suitable steel or brass, adhering in essential dimensions and details to the makers' drawings. It has been extensively tested under steam.

The other engine by Messrs. Tapper and Kent is a semi-portable under-type compound, based

on the practice as adopted by the leading makes, mainly Messrs. Marshalls of Gainsborough. No castings are used, the entire engine being fabricated. The general dimensions are taken from an engine of this type still in use by Messrs. Mirror Laundries at Harborne, in conjunction with information from old catalogues. The engine is a working model operating on 80 lb. per sq. in. steam pressure.



Mr. C. W. Field's 5-c.c. o.h.v.-powered Alfa Romeo, based on the Type 158 *mono-posto*

Mr. S. E. Stevens, of Folkestone, a well-known exhibitor in the past, has entered a working model mill engine of $1\frac{1}{2}$ in. bore and 2 in. stroke fitted with a long-stroke feed pump and controlled by a Hartnell type governor.

A single-cylinder $\frac{3}{8}$ in. by $\frac{5}{8}$ in. engine with Stephenson link motion and boiler feed pump is entered by Mr. D. H. McDermott of Streatham, and a horizontal engine of $1\frac{5}{8}$ in. bore by $1\frac{3}{8}$ in. stroke with reversing gear, governor and feed pump is entered by Mr. V. B. Ferguson of Cheltenham.

At least one representative example of a triple-expansion engine is entered by Mr. C. S. Knapp of Ashford, Middlesex. A compound condensing marine engine having cylinders $\frac{5}{8}$ in. and $\frac{7}{8}$ in. bore by $\frac{3}{4}$ in. stroke is shown by Mr. T. Spike of Exeter. This model is complete with boiler, and was made without drawings or castings, from odds and ends of material. Mr. T. D. Walshaw exhibits a complete steam plant comprising a two cylinder $\frac{3}{8}$ in. by $\frac{1}{2}$ in. double-acting oscillating steam engine and boiler.

Among the more unusual models in this section may be mentioned the 4-pole shunt-wound generator by Mr. R. L. A. Bell, whose horizontal stationary petrol engine, based on the design of the MODEL ENGINEER road roller engine, attracted a good deal of attention at last year's "M.E." Exhibition. This is not a copy of any particular make, but representative of a full-sized machine of 15 to 18 kilowatts output. The model produces approximately 20 W at 6 V and 3.5 A, running at a speed of 1,600 to 1,800 r.p.m. No castings are used, all parts being fabricated. This generator is intended to be driven by the horizontal stationary engine above referred to.

Mr. E. H. Evans, who has been distinguished in the past for his accurate scale models of complete power plant installations, has entered a model of the Loch Striven hydro-electric water driven turbine with alternator, exciter, governor, etc.

Model Cars

In the Model Car Section there will be a number of exceptional examples of the high degree of craftsmanship which has been attained in this field.

A very fair working scale model of the "E" type E.R.A. is sure to attract the attention of all who appreciate fine miniature automobile engineering and will show what really can be done by those who aspire to truly representative reproductions in miniature of the full-sized counterparts.

Another good example will be the "158" Alfa Romeo, fitted with 5 c.c. overhead valve engine, and body beaten up from sheet aluminium.

On the strictly "Special" side is a chassis fitted with a twin-cylinder super-charged engine of 10 c.c. capacity, driving front and rear wheels through bevel gear boxes. Suspension is independent, on the torsion bar principle.

Mr. Buck's famous 10 c.c. record-holding "E"-type E.R.A. "Topsy" will be in the Competition Section this year, and will give many enthusiasts who have not, so far, had the opportunity of inspecting this car, a good idea of what a really top-line, home-built speed model looks like.

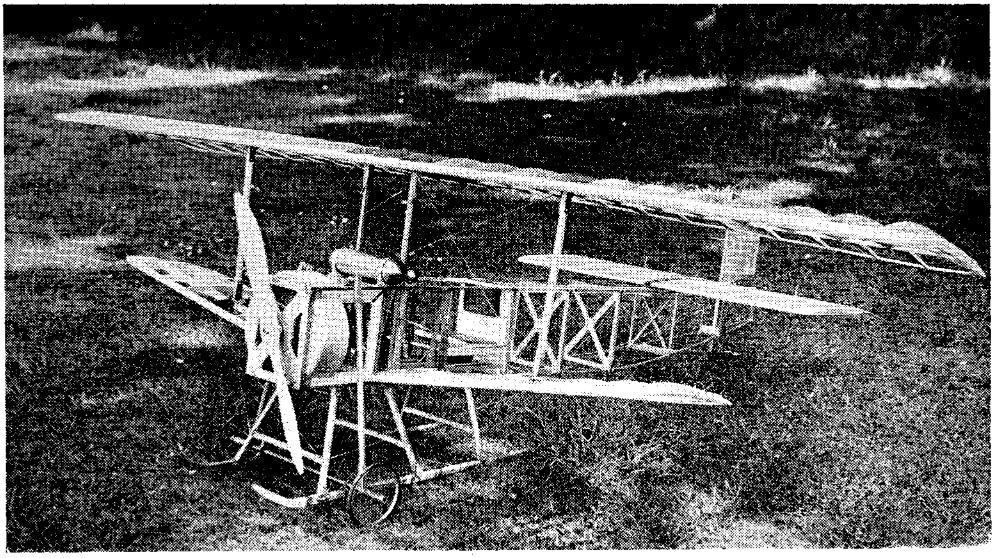
Further examples include yet another car based on the *Model Car News* " Special," and the ever popular " D " type E.R.A.

Model Aircraft

A background representing blue sky and clouds will form an appropriate and attractive setting for the model aircraft entries in the Competition Section. This year the aircraft models will form a separate exhibit and although it will be possible to examine them closely, a guard rail will protect them from possible damage by careless visitors.

Models driven by petrol or compression-ignition engines form the largest number of entries, and it is in this class that many of the most outstanding models are to be seen. There is also a very noticeable increase in the popularity of the flying scale model, and one of these which is sure to attract a great deal of admiration is a 1/6th scale model of the Bristol Racer—a biplane of 1911 vintage—by E. A. U. Rogers of Weybridge, Surrey. This model, which is powered by a 10-c.c. petrol engine, has working controls including a pendulum-operated automatic rudder. Another model in this section which should not be missed is a 64-in. span de Havilland " Dominie " entered by S. J. Ranger of Newport, Mon., and powered by 2 Frog " 180 " diesel engines. E. W. Dyer of Norbury has entered a 1¼ in. to 1 in. scale Chrislea Ace which is powered by a 1 c.c. diesel engine and is noteworthy for its excellent finish. An ambitious project is the 8 ft span Brabazon II model entered by R. Hill of Purley, Surrey. The overall length of this model is nearly 5 ft. and the weight 4 lb. and it has been designed as a free-flight competition model. Other free-flight scale models which should be seen are the 54-in. span Auster J4 by D. Wynch of Nottingham, and a 36-in. wing span Tiger Moth, entered by C. K. Grover of Gravesend, which is finished in the colour scheme of R.A.F. Reserve Command and carries the registration letters of the London University Air Squadron.

Free-lance free-flight power models which must be mentioned are a 5-ft. span biplane by J. A. Newton of Blackheath which features a completely cowled engine hidden by a dummy radial motor, and a very nice parasol wing monoplane entered by P. L. Petch of West Wycombe, Kent, both models being noteworthy for their excellent finish.

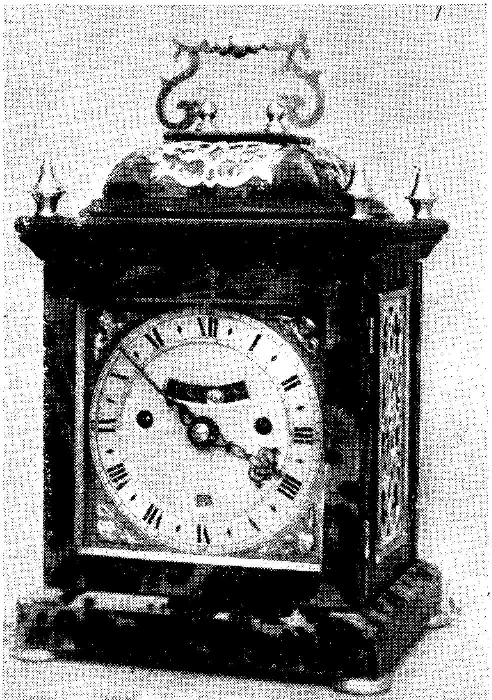


A fine 1/6th flying scale model of a Bristol Racer of 1911 vintage by E. A. U. Rogers, of Weybridge, Surrey. It is powered by a 10-c.c. petrol engine and has a pendulum-operated automatic rudder

Control-line models again form a large proportion of the power-driven models on show and one of the most attractive is a scale model of a British European Airways " Viking " aircraft entered by H. A. Gibbs of High Wycombe. This model which is powered by two E.D. Mark III diesel engines has a fully retracting and detracting undercarriage which is operated by a third line. Its beautiful finish was obtained by means of nine sprayed coats of dope and polish. In this class are to be found many excellent models of 1914/18 War aircraft, including a Sopwith Pup by R. Bonsey, a Bristol Scout by R. S. Martin of Seven Kings, a Fokker Triplane by C. Bonsey (Southall) all of which are worthy of close inspection. Other control-line models which should be seen are a Bristol Beaufighter entered by E. J. Pithers (Kensington) which has working navigation and landing lights, the latter being switched on when the engines cut, and an excellent de Havilland Hornet, powered by two Mills 1.3 diesel engines, which has been entered by P. Donavour-Hickie of Horley, Surrey. This model has many flying hours to its credit, and will take-off on one engine or will fly with either engine stopped.

R. F. L. Gosling of Liverpool has entered a

7-ft. span sailplane which features automatic aileron control and is up to his usual high standard of workmanship. Other sailplanes worthy of mention are those by H. C. Baines (New Cross) and G. Foden (Chelmsford).



A miniature bracket clock by Mr. C. B. Reeve, of Hastings

The stand of the Society of Model Aeronautical Engineers which adjoins the Model Aircraft section of the show will again be the meeting place of club members from all parts of the country, and great interest will undoubtedly be centred on the exhibit of British and foreign models which have competed in the Wakefield International Contest. Also to be seen on this stand are models which hold worthy British records.

The Working Models Arena

One of the most spectacular features of the MODEL ENGINEER Exhibition, and to a large percentage of our visitors the most fascinating, will be the Working Models Arena, incorporating the Circular Track for miniature racing cars, the tank for model power boats and the central platform from which demonstrations of control-line aircraft will be given.

Readers who attended the previous two Exhibitions will recall the splendid performances put up by the models displayed in the Arena, and this year, with new developments in all branches of model engineering, there is no doubt that visitors will find an added abundance of interest.

In addition to the demonstrations given by individual amateurs and clubs, the Arena will serve as a proving-ground for trade exhibits where prospective buyers may witness the performance of models and verify pre-purchase, the claims of the manufacturer.

The speeds of miniature racing cars in this country have risen steadily to nearly 120 m.p.h. and although, due to the necessarily decreased diameter of this circuit, the models displayed will not be run at anything approaching record speeds, keen observers will be able to note the latest developments in design and construction together with the many new details and refinements, all of which serve as proof that this sport is fast becoming one of the most popular attractions in the field of model engineering.

On the central platform will be seen many exponents of the control-line school of model aeronautics and demonstrations of stunt and speed flying will be given. The amazing degree of prowess which has been reached in this hobby must be seen to be believed, and the realism with which the numerous manoeuvres are executed speaks well for the forethought and accuracy of both designers and constructors, not to mention the "pilot" on the central platform who has to make but one minute error of judgment in order to demolish, in a split second, the outcome of many hours' toil.

The many lovers of model power-boats will revel in the numerous demonstrations of craft in the Tank, and there will be new kits and models on the trade stands to suit all tastes, with power ranging from clockwork to diesel, electric and steam units. Radio-controlled models will also be showing their paces.

After the 1948 Exhibition, the London Group of the Radio Controlled Models Society challenged the Manchester Group to a contest with model land vehicles, to take place at the 1949 Exhibition in the Arena. Manchester were offered the choice of using either the 27 Mc/s or the 465 Mc/s G.P.O. Model Control bands, London to use the other so that models could operate simultaneously. Manchester selected 27 Mc/s leaving London 465 Mc/s. It was realised that it would be difficult to decide finally the exact form of the contest until the capabilities of the models became apparent; but it will be chiefly a contest of control—manoeuvrability—with mechanical qualities, speed and power of secondary importance. The size of the models was limited to 3 ft. long, 18 in. beam and 18 in. high (excluding aerial).

London Group decided to build a DUKW, and Manchester a Landrover, both being electrically driven and controlled. Of the two, the DUKW will be more complicated electronically, having a 5-channel system controlling engine speed and steering, and auxiliary functions; the Landrover is to be operated on a single-channel with mechanical control gear.

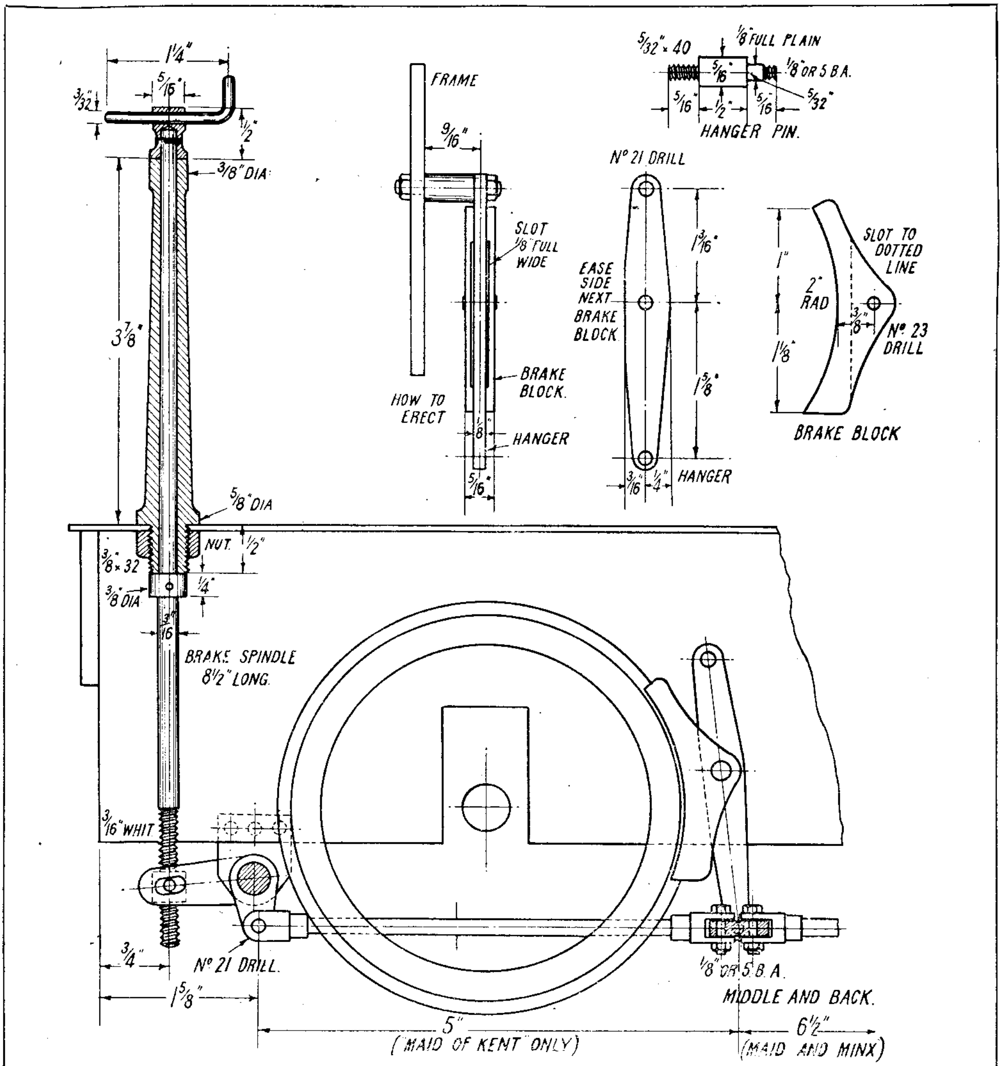
The extent to which the models will be operated at the Exhibition will depend on the staying power of the batteries and the operators; 3.0 p.m. and 7.0 p.m. are provisionally fixed, daily times will be posted at the Exhibition, and on the Society's stand, where the models will be on show when not running.

The Arena is so placed this year as to allow easy accessibility from all parts of the Hall.

Tender Brakes for "Maid of Kent"

by "L.B.S.C."

As there is actually not a great deal of difference between the brake rigging on an engine and tender, it should not be necessary to repeat all the ritual; so I'll just indicate the variations, and save both time and space. The blocks, hangers, and hanger pins are all made by exactly the same process as described for the engine, but to the sizes and shapes given in the accompanying illustrations. One slight variation is that the end of the pin carrying the hanger is shouldered down and screwed for a smaller nut. The hangers are, of course, fixed on the inside of the frame instead of outside, as the tender has outside bearings. The beams are made in the same way as the leading beam on the "Minx," but from ⅝-in. by 5/32-in. flat bar steel, the sizes



Details of the tender brake gear

of the spigots and screws being given on the accompanying detail illustration. The above parts can be made and erected right away, without the least difficulty.

Brake Column

Our "approved" advertisers may be able to supply a casting for the hand-brake column. If they can't, it can be turned from a piece of $\frac{5}{8}$-in. round brass rod a shade over finished length, $4\frac{3}{8}$ in. Chuck in three-jaw, face the end, turn down $\frac{1}{2}$ in. length to $\frac{3}{8}$ in. diameter, and screw $\frac{3}{8}$ in. by 32. Then centre the end, and drill a $\frac{3}{16}$ in. hole clean through it. I've just put my $\frac{3}{16}$ in. drill in the tailstock chuck, and find that there is $2\frac{3}{4}$ in. of it projecting; the clearing drill, No. 11, projects still more. Therefore, either of these drills will do the needful if put in from one end as far as they will go; the piece of rod is then reversed in the chuck, the other end faced and centred, and the drill put in from that end until the bores meet in the middle. Tip for beginners: keep withdrawing the drill every $\frac{3}{16}$ in. or so, and clear the chips out of the flutes, especially when they are in the hole to full depth. If anybody wants to make certain of a good bore and absolute accuracy, it would be policy to make a long $\frac{3}{16}$-in. D-bit, which is only a few minutes' work. The hole can then be started by the drill, and finished with the D-bit, without reversing the piece of metal, if you so desire; but keep on withdrawing, and clearing chippings, or else the whole shebang will seize up.

Now chuck a short bit of rod, any size above $\frac{1}{2}$ in. diameter, and about $\frac{1}{2}$ in. long, in the three-jaw. Face, centre, drill through with letter "R" or 11/32-in. drill, tap $\frac{3}{8}$ in. by 32, countersink slightly, and skim off any burrs. Screw the end of the embryo brake column into this, support the other end by bringing up the tailstock centre and letting the point enter the hole in the end, and turn the outside to the outline shown. Just slew your top slide around a little, and use a round-nose tool. Finally, make a $\frac{3}{8}$-in. by 32 nut from a bit of $\frac{1}{2}$-in. hexagon brass rod.

The spindle is an $8\frac{1}{2}$-in. length of $\frac{3}{16}$-in. round steel rod; either silver-steel or ground rustless will do. Screw one end $\frac{3}{16}$ in. Whitworth, for a length of about $1\frac{1}{4}$ in. The upper end is furnished with a fancy boss, to carry the cross handle. Chuck a bit of $\frac{3}{8}$-in. round steel, face the end, centre, and drill down about $\frac{5}{16}$ in. with No. 14 drill. Turn to shape shown, and part off at $\frac{1}{2}$ in. from the end. Squeeze this on to the plain end of the brake spindle. A No. 48 cross-hole can be drilled in the neck, and a bit of 15-gauge spoke wire pressed in for a pin; file flush both sides. If you like, you could leave the turning to shape until after the boss was pressed on and pinned; chuck the spindle with the boss close to the jaws, turn the outline, face the end, and the pin will be invisible. Drill a No. 43 hole across the upper part, squeeze in a $1\frac{5}{8}$-in. length of 3/32-in. round or rustless silver-steel, rounded off a little at both ends, so as to avoid injuring the fireman when he is testing his muscles. Bend up $\frac{3}{8}$ in. of the cross wire at one end, and you have a dinky handle.

Chuck the $\frac{3}{8}$-in. rod again, centre, and drill No. 13 for about $\frac{3}{8}$ in. depth; part off a $\frac{1}{4}$-in. slice to form the collar. Put the spindle down the column, push the collar over the screw, and slide it along until it touches the bottom of the column, and pin it, same as the handle boss. The spindle should be free to turn, without any up-and-down play. The collar should be just small enough to pass through the nut.

Now watch your step. At $3\frac{9}{16}$ in. from the tender centre-line, to your left, as you look at the front of the tender, and 1 in. from the front edge of the soleplate (that is, $\frac{3}{4}$ in. from front edge of frame plates) drill a $\frac{3}{8}$-in. clearing hole clean through soleplate and top of drag beam. Clean off any burr, then put the screwed part of the brake column through it, and fix with the nut. If you have made a right-hand-drive engine, the column will be fitted in a corresponding position on the other side of the tender. Note, this brake column is for "Maid of Kent" only; the "Minx" has a different type of column, and I will give a separate drawing of it; maybe next week, if all's well.

Brake Shaft

The brake shaft is made from a piece of $\frac{3}{8}$-in. round mild-steel rod, $7\frac{1}{8}$ in. long. Chuck in three-jaw, face the end, and turn $\frac{7}{8}$ in. length to $\frac{1}{4}$ in. diameter. Reverse in chuck, face, and turn $\frac{1}{4}$-in. spigot $\frac{3}{16}$ in. long. The distance between shoulders should be 6 in.

The drop-arm is an easy job, filed up from a bit of $\frac{1}{8}$-in. steel plate (odd scrap of frame steel does fine) and drilled and reamed as shown. It should be a tight fit on the shaft. The brake arms are precious little more! File or mill them from $\frac{1}{8}$-in. steel plate. The slot is formed by drilling two No. 21 holes close together, and joining them by judicious application of a rat-tail file. Drill a $\frac{1}{8}$-in. hole in the other end; then chuck a bit of $\frac{1}{2}$-in. round mild-steel in the three-jaw, and turn a $\frac{1}{8}$-in. pip on the end, to a tight fit in the hole. Part off at 5/32 in. from the shoulder. Ditto repeato, then squeeze the pips into the holes in the arms, and braze them; just apply a little wet flux, heat to bright red, and touch with a bit of soft brass wire, or Sif-bronze rod, which will melt and form a fillet. Quench in water, wash of, and clean up; then chuck the bosses in the three-jaw, making sure the arm on each runs truly. Face off any of the pip which protrudes beyond the arm; centre, drill letter "C," or 15/64 in., and ream $\frac{1}{4}$ in. Put the drop-arm right in the middle of the shaft, and braze that too, in similar fashion. You can use silver-solder if you like, for both jobs, but brazing—like the posters on the hoardings say about beer—is best. Incidentally, I've never tasted beer—don't like the smell—so I'll never be able "to see what toucan do!!"

Brake Nut and Brackets

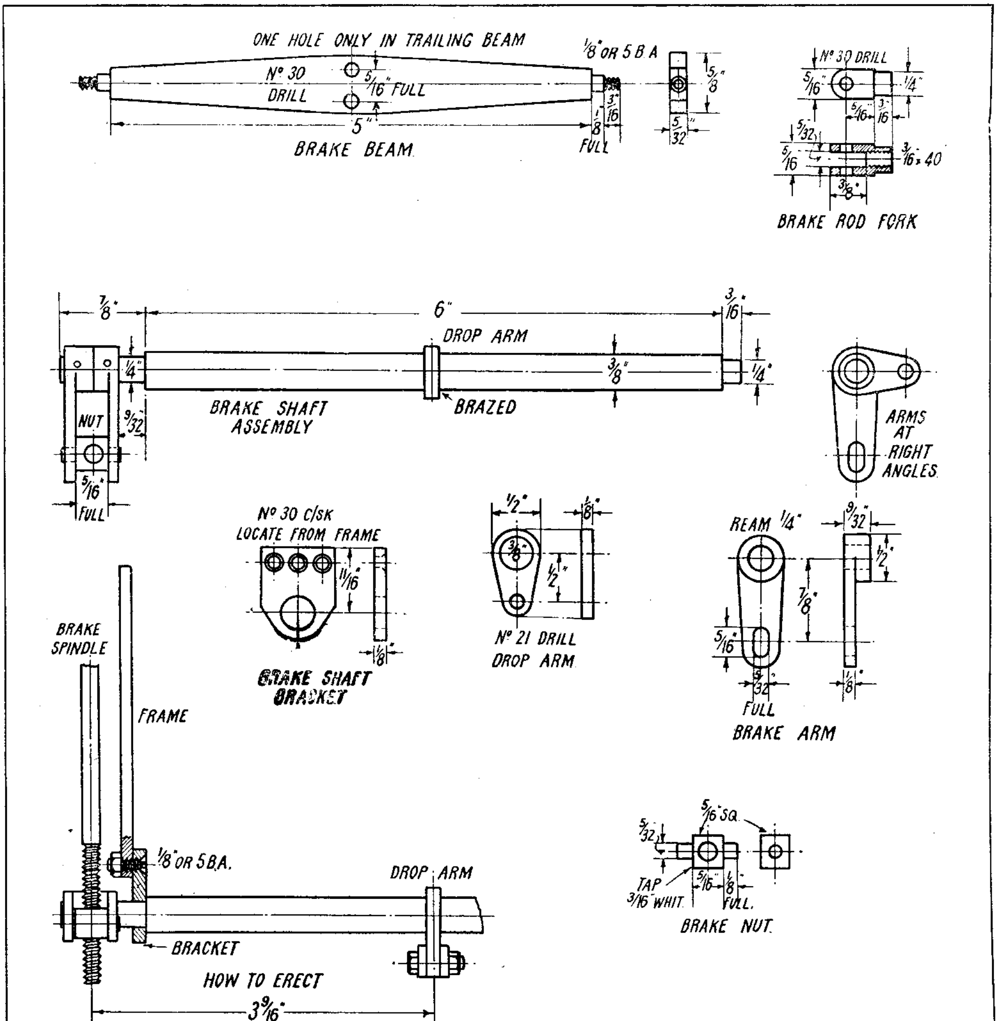
For the brake nut, chuck a piece of $\frac{5}{16}$-in. square steel, or hard bronze, in four-jaw, and set to run truly; face the end, and turn down a full $\frac{1}{8}$ in. length to 5/32 in. diameter. Part off at a full $\frac{7}{16}$ in. from the shoulder; reverse in chuck, and repeat operation. Beginners note, you can reverse square stuff in a four-jaw, and rechuck truly, by slacking and retightening the same two jaws. Drill a No. 21 hole through the

cube and tap $\frac{3}{16}$ in. Whitworth. The coarse thread makes for quick action, and there is no chance of stripping.

The brackets are milled or filed up from $\frac{1}{8}$-in. steel plate, another simple job needing no detailing. Drill and ream the $\frac{1}{4}$ in. hole, then locate and drill the screwholes from the tender frame. To drill these, mark off a point $1\frac{5}{8}$ in. from front edge of frame, and $\frac{1}{8}$ in. from the bottom edge; drill a No. 30 hole there, and another one each side of it, on the same level, and $\frac{1}{4}$ in. away. File off any burr, then put a bracket in the position shown, hold it with a toolmaker's cramp, and drill it, using the holes in frame to guide the drill. Ditto repeato on the other side of frame; but before drilling the screwholes, poke a piece of $\frac{1}{4}$-in. steel through both the bigger holes, and see that it lies fair and square across the frames, and is quite level. Adjust bracket if necessary, then tighten cramp, and go ahead with the drilling. Countersink both brackets on the inside, and mark which is which.

How to Erect Brake Shaft

Put the correct bracket on the longer end of the brake shaft, countersinks on the inside, then put on a brake-arm, boss outwards; place nut in position, and put on the other arm, as shown in the assembly sketch. The centre of nut must be $3\frac{9}{16}$ in. from the centre of drop-arm, and the arms at right-angles to it. The nut must be free to move the full extent of the slots. The bosses of the brake-arms can be pinned to the shaft by bits of 15-gauge spoke wire.

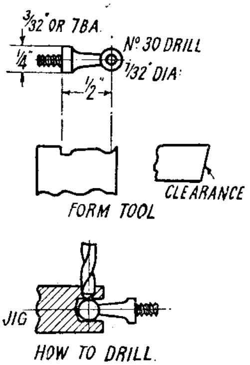


Details of brake gear. (Note—ream brake shaft bracket $\frac{1}{4}$ in.)

Put the other bracket on the other end of shaft, hold in position with the nut under the screw on the spindle; turn the handle, and the screw will pull up the nut, so that the brake shaft comes into position. All you then have to do, is to line up the holes in the brackets with those in the frame, and put three $\frac{1}{8}$-in. or 5-B.A. countersunk-head screws through the holes, with nuts outside the frame. Where there is a lot of vibration, as in the present position, I recommend the use of weeny spring washers under the nuts; our advertisers can supply them. The brake shaft should now operate easily by turning the handle. If the spindle is oiled before inserting in the column, it will not need any more for a very long period; but a hole can be drilled in the column near the top, through which a spot of oil may occasionally be introduced via the driver's bosom companion.

Pull-Rods

All we now need, are six forks and three pieces of $\frac{3}{16}$-in. steel rod, to connect up. A drawing of the forks is given here, and as they are made exactly the same as valve-gear forks, there is no need to repeat the rigmarole. The front piece of rod is approximately $4\frac{1}{4}$ in. long, and the middle and rear rods $5\frac{3}{4}$ in. long; screw for about $\frac{1}{4}$ in. each end. When the forks are screwed on, the distance between pin-holes in the front rod should be $4\frac{13}{16}$ in., and between pin-holes on the other two $6\frac{3}{16}$ in.; the latter will be the same on the "Minx;" as the wheelbase is similarly divided. Note that the front fork is drilled No. 21, and attached to the drop-arm by a bolt made from a piece of 5/32-in. round silver-steel, shouldered down to $\frac{1}{8}$ in. at both ends, screwed $\frac{1}{8}$ in. or 5 B.A., and furnished with commercial nuts. When these are right home, the pin should be free to turn with your fingers. The other forks can be attached to the beams, by $\frac{1}{8}$-in. or 5-B.A. bolts and nuts, as shown; or if you prefer, $\frac{1}{8}$-in. by $\frac{1}{2}$-in. ordinary commercial split-pins can be used. Just poke through from the top, and spread the points just enough to prevent them coming out. If the blocks do not all touch the wheels at the same time when the handle is turned, merely adjust the forks on the rods until they do. The construction of the brakes for the "Minx" is exactly the same as described above, the only difference being in the shape of the column, brake blocks, and a few measurements; so if I give the drawings and dimensions, "Minx" builders can go right ahead without further detailed notes.



How to make handrail knobs

How to Make the Handrail Knobs

This job has been described before, but I am repeating instructions for beginners' benefit. The operation is very simple. Merely get an old flat file which has outlived its original purpose. Soften the end; this is best done by leaving it in the fire overnight, and letting it cool slowly when the fire dies out. Then back it off—that is, slope the front edge from top to bottom, as shown —and file the outline of the knob in the end. Finish with a fine file, as smooth as possible; harden and temper to dark yellow, and rub the cutting edge on an oilstone.

To use, set it in the slide-rest tool holder, with the cutting edge level with the lathe centres; put a bit of $\frac{1}{4}$-in. round rod in the chuck, and feed carefully in until the shape of the knob is formed. If the tool chatters, it is because the lathe is not stiff enough for the job, or else you are operating too far from the chuck jaws. Part off with an ordinary parting-tool, and chuck separately, shank outwards, to screw the shank. If the outline is cut the other way around, the sharp point could be arranged to do the parting off; but the trouble is, that the pressure on the rest of the edge might break off the knob before the head is properly formed.

To drill the knobs, all you need is a bit of bar, with a hole in the end in which to insert the ball end, and a cross hole to guide the drill; the sketch explains itself. This is far easier, and certainly much quicker, than setting up each one on an angle-plate, as was described by another writer many moons ago.

More Ancient History

In a recent article on steam cylinder passages, the writer of same, quoted some ancient history; therefore, your humble servant may perhaps be forgiven for quoting a little more, and going back a little farther still. Way back about the time of Queen Victoria's jubilee, a little kid known as Curly acquired a toy locomotive named "Ajax," with a tin boiler fired by a single-wick spirit lamp, and a pair of oscillating cylinders, which drove the rear wheels. These cylinders had pistons made from stamped cups; they were, when new, very free, though quite steam-tight, and allowed no perceptible blow-by. Nevertheless, the little boiler, though quite a free steamer for its type, could not make enough steam to maintain continuous running; it was a question of "stop-and-blow-up" every so-often. The kid was rather disappointed; but he had a real steam-driven locomotive, something he had craved for years, so was duly thankful.

In due course, the pistons became worn, and steam blew past. In order to make a packing groove in the pistons, the boy made them solid, by filling up the cups with solder; he then filed grooves, having no lathe (otherwise he would have made new pistons) and packed them with wick from an old-fashioned tallow candle. When he got up steam again, he got a pleasant surprise—*the engine would now run continuously*! There was a little grey matter under that mass of long yellow curls, and it began to work. He reasoned out that the steam had no longer to fill the cups, as the pistons were now solid, so that two "cupfuls" of steam were saved at each turn of the wheels. Therefore, thought the boy, if I fit longer piston-rods and make the pistons almost touch the end of the cylinder, more steam still

will be saved, and the engine will get up pressure and pull a big load. To cut a long story short, as Nat Gubbins would say, he did—and the engine performed as expected. Cutting out the "useless voids" turned a failure into a success.

History Repeats Itself

The little kid grew up, and went to work on the railway, learning a lot about full-sized locomotives, including cylinders, ports, and passages. He also did a lot of experimenting with little engines, acquiring much valuable and practical knowledge thereby. Well, one day a friend brought along a locomotive which he had built, to a description given by old Curly, now well along the track of the Great Railroad of Life. This engine was a real glutton for coal and water. She went all right, but the blast very nearly blew the chimney off; although only $2\frac{1}{2}$-in. gauge, with a 3-in. boiler, a feed pump $\frac{5}{16}$-in. bore by $\frac{3}{8}$-in. stroke, could not feed in enough water to maintain constant level in the gauge-glass, whilst the shovel was hardly out of the operator's hand when she was running. The builder could not understand it. The engine was made to specification, except that the cylinders were built up. I checked her over. Valve-gear was O.K., the valves properly set, admission and cut-off as specified. Then I remembered the toy "Ajax," asked a couple of questions, and the mystery was solved.

The Fallacy Exposed

When building up the cylinders, the maker thought to improve on the specification which called for drilled passage-ways, and had milled out his port blocks in exactly the same way as illustrated in the article referred to, giving a rectangular passage between port and bore, measuring roughly $\frac{5}{8}$ in. long by $\frac{1}{8}$ in. wide. Now, although he had only allowed my recommended clearance between pistons and cylinder covers, the steam had to fill up these huge spaces to steam-chest pressure, before the same pressure could be exerted on the piston-head; and not only that, as everything on this earth takes *time* (even a flash of lightning) the time taken between the opening of the port, and the building up of the full pressure, was sufficient to make the timing late. The normal "lead" opening was not sufficient to pass the requisite amount of steam before the piston commenced its stroke. Then the added volume of steam in the huge passages had to be exhausted; and the exhaust pressure being high, on account of this extra volume, the blastpipe nozzle not only had to be enlarged, to get rid of the steam, but the violent blast burnt up the coal—completing the vicious circle, for it boiled away more water to make extra steam, to fill the "voids" *and be blown to waste without doing one iota of useful work*!

The Remedy

I figured that three 3/32-in. holes between port and bore, would be ample to pass the small amount of steam that the engine *should* use when working; and the builder blocked up his huge passages, and drilled the holes as recommended. The result was absolutely astounding; the coal consumption dropped by over 50 per cent., the pump promptly flooded the boiler, the blast, instead of sounding like a machine-gun, dropped to the sound of a kitten purring, and the liveliness of the engine, *due to the absence of back pressure*, was improved out of all recognition. So that was that!

The Proof of the Pudding

To be quite frank, it doesn't matter a bean to your humble servant what arguments are put forth, and what "evidence" is produced; as Bobby Burns said, "Facts are chiels that winna ding, an' downa be disputed." I've been collecting facts for many more years than I care to remember. One fact happens to be, *that with an efficient valve setting*, there isn't enough steam left in the cylinder on the exhaust stroke, to fill huge passage-ways by compression; therefore they have to be filled with boiler steam at each stroke, *which is blown to waste.* As the passages are always full open, they only need to be large enough to pass, without let or hindrance, the amount of steam used by the cylinders when running normally at high speed. This is also ample at low speed with late cut-off, as it stands to reason that the steam then has more time to traverse them. Same applies in full-size practice. Proof? Ask yourselves—why do all modern locomotive cylinders have the piston-valve bobbins spaced out so that the steam passages should be *as short as possible*? It isn't only to get a direct straight passage, *but to cut down the clearance space to the minimum amount required for efficient working*; to use the steam instead of wasting it.

The late Mr. Henry Lea was a fine workman and a clever engineer; his Midland single-wheeler was a fine job—*for its day.* It spent its working life either running light on a circular track, or jacked up on a testing stand. Put it on the B.S.M.E. track at Sheldon with a load; what would happen? The smallest "Live Steamer" in the club would probably lick it to a frazzle for hauling power and general efficiency. The late Mr. Percival Marshall, of blessed memory, on one occasion told me, with a smile, that he once thought it marvellous when he saw, on a visit to Germany, a small single-wheeler maintain pressure running light. A few evenings ago, time of writing, Dick Simmonds drove my own single-wheeler "Grosvenor" for over 20 minutes without touching the fire. When notched up, the blast is inaudible. You only need a small blast nozzle when you only have a weeny whiff of steam to exhaust—'nuff sed!

Tailpiece

Several Kentish readers who have a warm corner in their hearts for old "Invicta," who still stands at Canterbury after defying Jerry and all his works, want to know if it would be possible to bring her to life in $3\frac{1}{2}$-in gauge as a working proposition. It would; and provided our friend the K.B.P. doesn't object, I'll see if I can manage a "snippet" article showing how this can easily be done. I've often thought, when passing her on my gasoline cart, now here's a fine engine all ready to take the train on, when a "spam can" breaks down!!

THE WICKSTEED REGATTA

Competitors in the steering competition with their prototype boats. Note the model DUKW on the right

THE annual regatta held at Wicksteed Park, Kettering, is always a red-letter day to model power boat enthusiasts, and this year the event, held on Sunday, July 3rd, was an even greater success than ever. In contrast with last year's regatta, when the inclemency of the weather damped everything but enthusiasm, the sunshine was turned on at full blast, and one of the burning problems of the day was how to keep reasonably cool.

The programme opened with the 1,000 yards race for the Newman Loake Cup (" A " class), in which only three boats took part. In a race of this length, stamina is as important as speed, and it is of interest to note that not only did all three boats stay the course, but that two of them achieved a notable speed. Mr. W. H. T. Meageen (Altrincham) whose consistent efforts over many years appear at last to be reaping the success they deserve, was the winner, with *Samuel*, at a speed of 46.49 m.p.h. But for a rather hesitant start, this figure would have been substantially higher, as laps were timed at over 51 m.p.h. in the later stages of the race. The boat is propelled by a 20-c.c. flat-top two-stroke of unique design, with glow-plug ignition, and its performance is all the more creditable in view of the engine capacity being 10 c.c. below the allowed " A " class limit. Mr. K. Williams (Bournville) was second with *Faro* at only slightly lower speed, 44.63 m.p.h., and Mr. D. Harlow (Bournville) third with *Doreen* at 24.1 m.p.h.

Next came a highly popular event, the Personal Refuelling Competition—in other words, the lunch interval, and it may here be placed on record that not only the catering facilities at Wicksteed Park, but also the hospitality of the home club are second to none which have so far been enjoyed by the model power boat fraternity. During this period, Mr. V. H. Grey, of Coventry, gave a 20-minute demonstration with his radio-controlled boat.

In the 500 yards race for the Paten Cup (" B " class) which followed, four boats were entered, but all were in trouble of some kind from the outset. Mr. B. Stalham (King's Lynn) had engine trouble with *Tha II*, which is usually a very reliable performer; the trouble was due to breakage of the oil pump delivery pipe. Launching difficulties defeated Mr. T. Dalziel's *Naiad* (Bournville), the very low freeboard of which tends to make it rather critical in this respect. Mr. G. Lines (Orpington) made a promising start with *Sparky*, but came to grief after three or four laps. The only boat to finish was Mr. Churcher's *Annette* (Coventry), which after two unsuccessful starting attempts, managed to put up a run at 21.04 m.p.h.

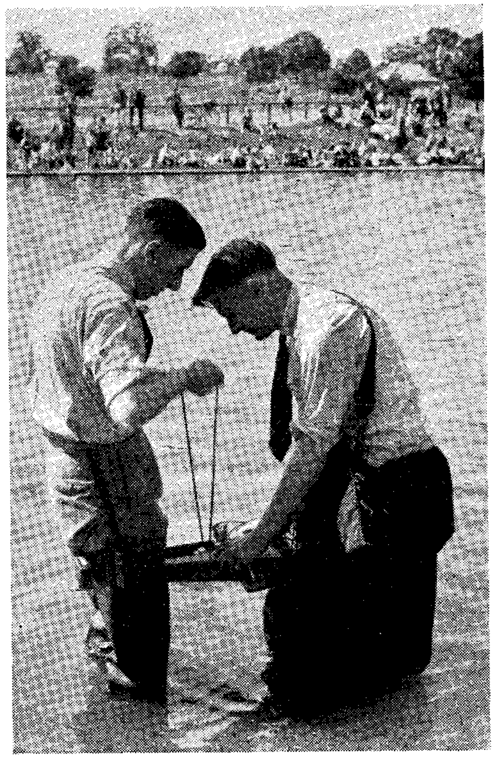
An additional race was organised this year for " C " class boats, and proved to be the most popular of the circular course events, so far as the number of entries was concerned; most of the boats also made at least one successful run over the 300 yards course. Home-constructed

engines appeared to be having an unlucky day, both Mr. Jackson (Derby) and Mr. Collier (Coventry) being still suffering from teething troubles, though there is little doubt that their boats are potentially capable of high performance. Eventually the race resolved itself into a close duel between Mr. Brealey (Derby) and Mr. Stanworth (Bournville), both of which made two successful runs round about the 30 m.p.h. mark. Mr. Brealey's best speed was 31.96 m.p.h. and Mr. Stanworth's 31.8 m.p.h.—truly a neck-and-neck race.

The 500 yards race for the handsome Timpson Trophy (" A " class) was contested by the same three boats as in the first event, but this time Mr. Meageen's *Samuel* was slower on its first run, attaining 34.61 m.p.h., and on a second attempt, which produced much better speed, it dived on the fourth lap, and suffered considerable hull damage. Mr. Williams was first, with 46.07 m.p.h., and Mr. Harlow third with 23.6 m.p.h.

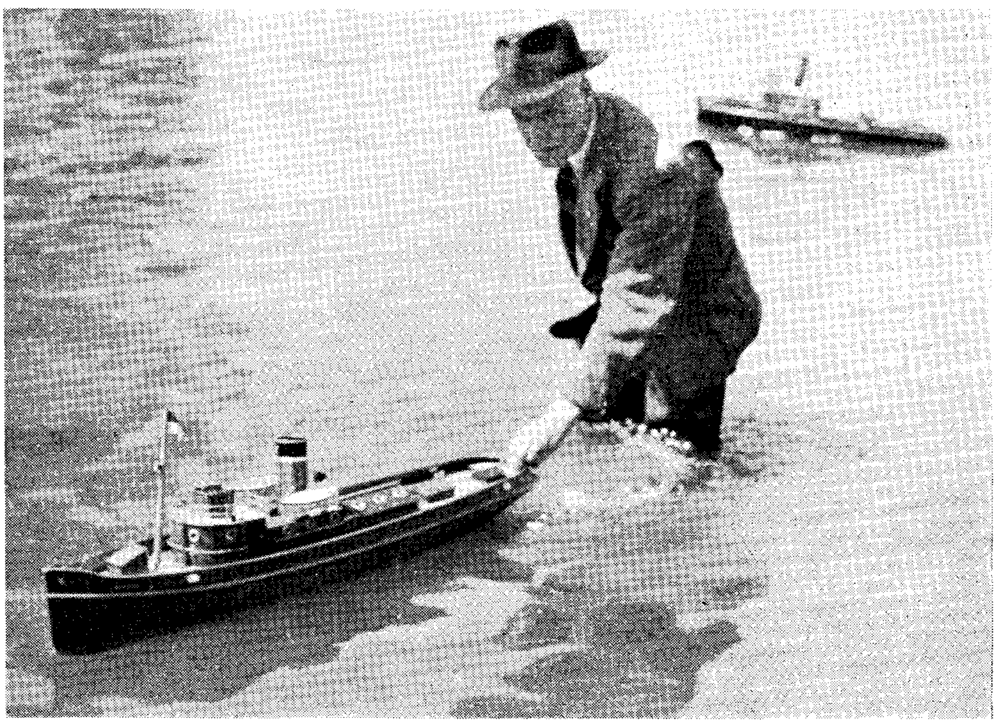
In the steering competition for the Whitworth Cup, many competitors failed to score ; as the length of the course was approximately 90 yards, and remarks were made that so far from hitting the target, one needed good eyesight to *see* it! Nevertheless, some boats made good scores under

(*Continued on next page*)

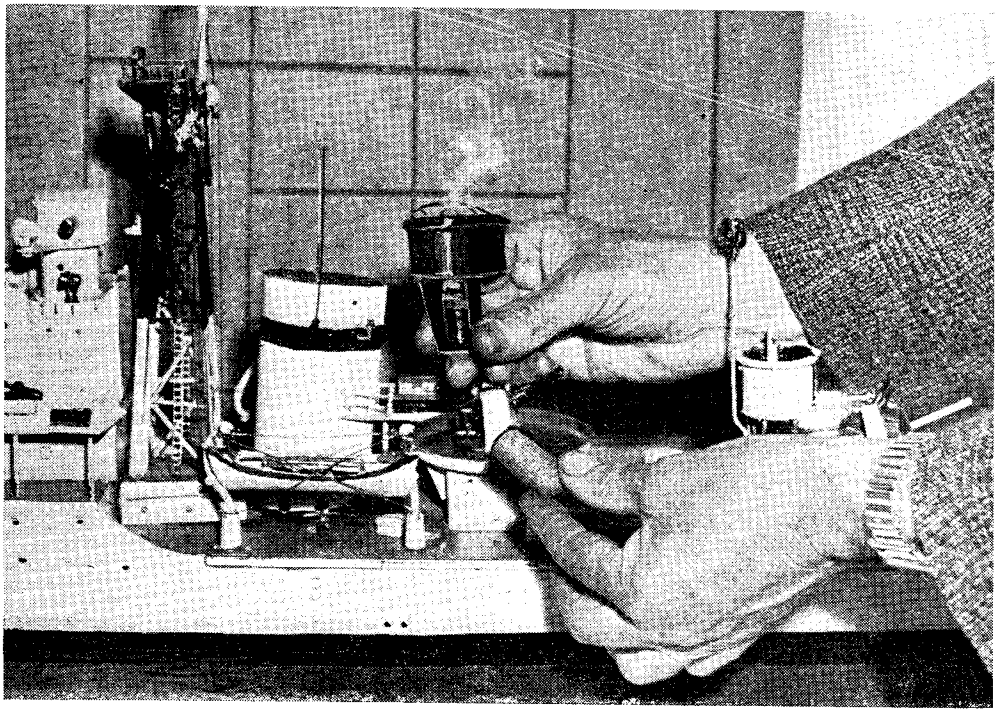


(Right) Mr. Collier (Coventry) assisted by a friend, starting up his 10-c.c. speed boat

(Below) Mr. A. J. Perkins (Victoria) with his petrol-driven tug " Canda "



Smoke Production for Model Steamers



FOR a long time, model makers with models having electric propulsion have sighed for a satisfactory smoke-producer which would show a "feather" of smoke from the funnel of the model and thus add considerably to the effect.

Mr. G. H. Davis, the Vice-Chairman of the Brighton Society of M.E. has now produced, after very lengthy experimental tests, a small cartridge which when ignited, burns slowly, giving a grey smoke which lasts for nearly half an hour. The smoke cartridge can be cut to suit model locomotives, etc., though it is primarily designed for marine working models. All that is required is to drill certain draught holes in the base of the funnel and provide a small cradle to hold the cartridge.

In the photograph, the cowl-top of the electric destroyer that Mr. Davis is sending to this year's "M.E." Exhibition is held in the right hand. The cowl top is easily detached from the funnel and has attached to it the cradle and the burning smoke producer. In the left hand is seen one of the cartridges. Shortly, these cartridges will be put on the market at a few pence each.

The Wicksteed Regatta

(*Continued from previous page*)

the circumstances. Fifteen boats were entered, and two runs only were allowed, the maximum points which could be scored being 10. Honours fell to Mr. F. Robinson (Coventry) with *Honey Bee*, which scored an outer and a bull, 6 points. This boat is driven by a Kestrel 5-c.c. engine with magneto ignition, all home-constructed.

Mr. V. H. Grey (Coventry) was second with his destroyer, propelled by a Gerald Smith 10-c.c. engine, scoring one bull, 5 points; and the third place was won by Mr. A. J. Perkins (Victoria) with his tug *Canda*, driven by a modified "Kiwi" 15-c.c. engine, arranged horizontally in the hull. His score was an inner and an outer, 4 points.

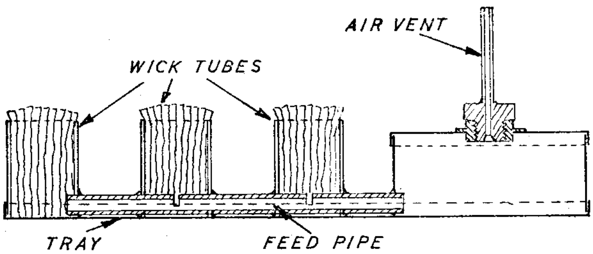
Prizes were presented in the tea pavilion by Mrs. H. C. Ward, one of the most enthusiastic and indefatigable of the home club's workers, assisted by her equally active husband and son, Messrs. H. C. and Douglas Ward.

The clubs which took part in the regatta, which was held under the auspices of the M.P.B.A., included Altrincham, Bedford, Bournville, Coventry, Derby, King's Lynn, and Victoria, in addition to the home club, Wicksteed Model Yacht and Power Boat Club.

*UTILITY STEAM ENGINES

by Edgar T. Westbury

THE question of boiler design must necessarily involve some consideration of the means employed for producing heat, by the combustion of fuel or otherwise; different types of boilers, as we have seen, have their individual preferences in respect of methods of heating, which must be carefully considered if maximum efficiency is to be obtained. Boiler firing, even when economy of fuel is a minor consideration, should never be applied by the "Rule of the Big Stick." One sometimes hears it said that any old boiler will steam if you apply enough heat to it, but this is only true up to a point, because as we have already seen, forcing a badly designed boiler will cause circulation troubles and eventually priming. The converse, however, is certainly true, namely, that the best designed boiler in the world will not steam efficiently without an adequate and suitable method of heating. Although the model engineer is largely exempt from some of the problems in steam generation which arise in full-size practice, particularly those connected with economics, he has to face others which are in inverse ratio to the size of the plant, such as those of obtaining efficient combustion in limited space, and avoiding the wastage of heat thus obtained.



A simple three-wick spirit lamp

Methods of Boiler Firing

In the class of steam engines under discussion, liquid fuel burners are by far the most common means of heating the boilers, and I propose to deal mainly with this type. No suggestion is made, however, that other methods of firing may not be worth consideration, or even in some cases, more efficient. For instance, the use of solid fuel has many advantages, and is almost universal in modern small locomotive practice, besides being used in some of the boilers used for driving model stationary engines, or for plant testing in M.E. Societies' workshops. I cannot, however, claim a great deal of personal experience in the use of solid fuel, and do not propose, therefore, to make a parade of my ignorance by discussing it with readers who may in many cases be much better qualified than myself in this respect. It may, however, be worth while to observe that the possibilities in the use of solid fuel in model marine boilers, which have hardly ever been explored, would repay investigation.

Simple Spirit Burners

I make no apology for dealing with the simplest form of liquid fuel burners; though many readers may associate them with the toyshop products of their juvenile days, and regard them as entirely out of place in serious model engineering, they are by no means beneath our notice, not only for their utility in light duty steam generation, but also as object lessons in the combustion of fuel.

Nearly all of the simpler types of commercially-made steam engines are spirit-fired, the form of burner being basically simple and cheap to produce, besides being easy to handle. Alcohol fuel (known as "spirits of wine" by our grandfathers, and in these days as "methylated spirits") is the easiest of all fuels to use for small heating appliances, because it will always burn with a clean flame even under the most adverse conditions and in the most primitive form of burner. Contrary to popular ideas, however, the complete combustion of this fuel is no easier to accomplish than that of other fuels, and it is generally used inefficiently and wastefully, combustion being very imperfect, and its products, though not visible in the form of smoke or soot, are painfully evident by the acrid smell. Even when consumed efficiently, however, alcohol has a lower calorific value than the majority of other liquid fuels, such as coal tar or petroleum derivatives—i.e., benzoline, naphtha, petrol or paraffin, though these have the disadvantage of requiring much more elaborate apparatus to enable complete and smokeless combustion to be obtained.

The simplest form of spirit lamp is that of the wick type, as used in toy engines, and consisting simply of a shallow reservoir with a central wick tube. This can only be made in relatively small sizes, however, as combustion in a single wick burner becomes less efficient as the size of the flame is increased, the centre of the flame being prevented from obtaining sufficient air to burn completely. It is also rather undesirable to put the actual spirit reservoir right into a more or less completely enclosed furnace, as it may become sufficiently hot to boil the fuel and cause a general flare-up. Mos of the larger spirit lamps are therefore arranged

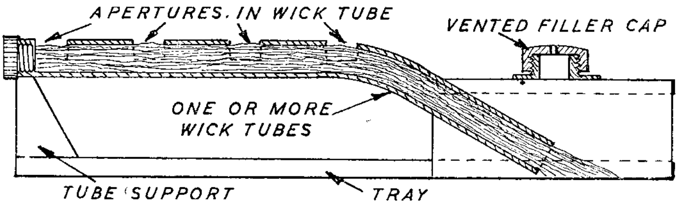
**Continued from page* 110, *"M.E.," July* 28, 1949.

with the fuel reservoir outside the furnace, and feeding the wick tube or tubes by an extension pipe.

Although it may be considered that the design of spirit wick lamps is so simple and obvious as to need no explanation, I have had several requests for information about them, and I am therefore illustrating two types with which I have had some experience, and have found fairly satisfactory within their limitations.

shown in the drawing of the three-wick lamp, to avoid the risk of ignition of spirit vapour.

The most suitable material for wicks is soft stranded cotton yarn, as used in the old flare lamps which can still be found in some engine shops. Asbestos wicks have the advantage of indestructibility, but do not absorb fuel so readily as cotton, and thus produce a smaller flame. The burning away of wicks, however, does not occur if they are properly fed with fuel. It is, of course,



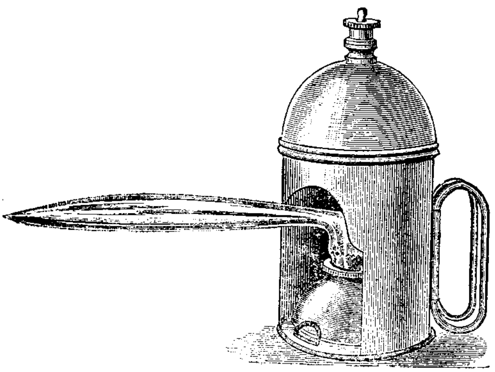
Lamp with single horizontal wick tube

The first is a development of the three-wick burner which has been extensively used in the better-class commercial models, including locomotives, where the wick tubes are sometimes arranged to be fed from a tender tank by a drip feed or bird-feed system. In this case, the very limited space between the loco frames and over the axles, calls for the utmost compactness of the wick tubes, which are sometimes flattened or elongated; it would not be possible to use the exact form of lamp shown, with a tray under the wick tubes, though this is recommended where it can be accommodated, as it avoids the risk of spirit which may be spilled from the wicks spreading beyond bounds. In a model boat, for instance, spilt spirit in the bilges is often the cause of a destructive fire.

In the second example, which has also been used commercially in modified forms, a single long wick tube is used, disposed horizontally for a part of its length, with several apertures in the top side to expose the wick. At the reservoir end the tube is bent downwards, though this is not absolutely necessary, so long as the wick is taken to the bottom of the fuel space. If the apertures are made too large, it may be found that very little fuel will reach those at the remote end of the tube. It is, however, practicable to increase the combustion rate, in cases where the size of individual burner apertures are limited, by fitting more than one wick tube, in parallel or radial formation.

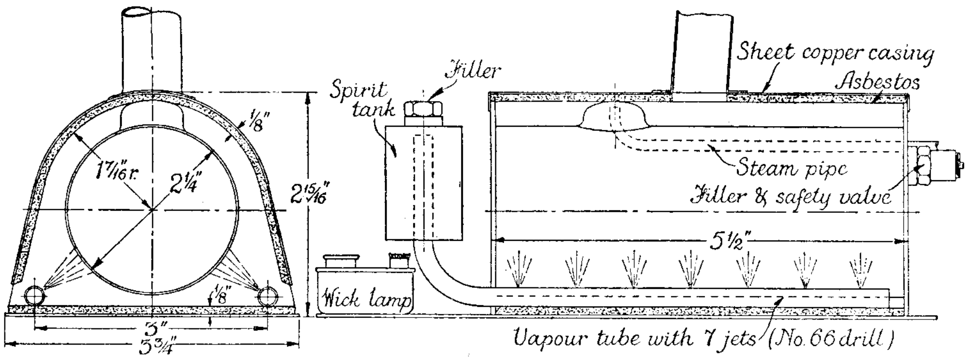
Both these lamps are easily made, in tin-plate, soft brass, or copper, and can be soft-soldered, as the temperature of the lamp itself should never be very high under normal working conditions. It is most important that the height of the wick tubes must be above the highest level of the fuel in the tank, and if the lamp is to be located in any position other than horizontal, the tubes should be arranged accordingly. On the other hand, however, it is not generally advisable to use long wick tubes, even if the height available under the boiler allows, which is not very often. The filler cap of the tank should always be air-vented, and it is a good idea to carry the vent pipe well up and away from the burners as

quite practicable to use much larger spirit tanks than those shown, or the small tank may be fed from a larger one by a bird-feed system. However, the use of a tank of limited size is advisable in firing boilers which have no provision for feeding water into them in the course of steaming; the tank should never hold enough fuel to evaporate all the water in the boiler. For this reason, I do not recommend the use of continuous spirit feed in the type of plant to which simple wick lamps are mainly applicable.


The form of spirit vaporising lamp known as the "French Blowpipe"

Vaporising Spirit Lamps

Even with the best wick lamps, combustion of fuel is rarely perfect, and is still less so when high rates of combustion are attempted. To increase the efficiency of steaming when spirit fuel is used, vaporising lamps are often used. Alcohol is readily vaporised when heated to a temperature below the boiling point of water, and the vapour behaves in much the same way as gas, so that it can be consumed efficiently in a burner of much the same type as for gas; that is to say, either a plain jet, or one on the Bunsen principle in which air is mixed with the vapour before ignition.

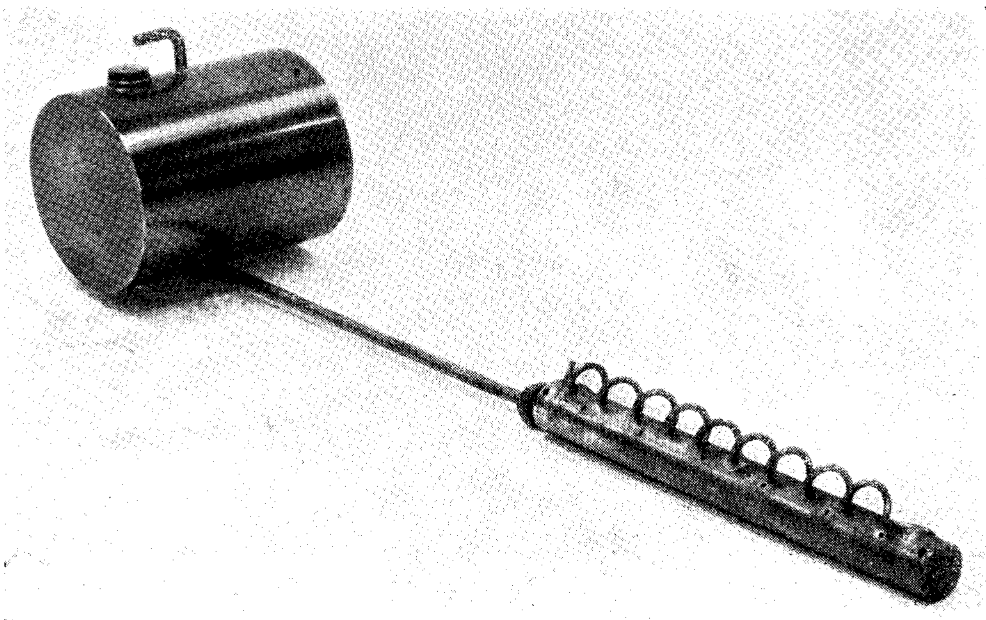


The form of spirit vaporising burner used by Mr. B. H. Joy for heating a boiler with a low centre of gravity

There are many forms of spirit vaporising lamps, but most of them are, in working principles at least, direct descendants of the device known as the "French Blowpipe," which was introduced about 70 years ago, and has been extensively used in all trades where light soldering and sweating is called for. It consists of two spirit vessels located one above the other in a sheet metal frame or casing; the lower one is a simple wick lamp, and the upper one is a closed "pot boiler," equipped with a safety valve and a vapour tube which extends from as close as possible to the top of the vessel, down through the bottom of same, where it is bent horizontally and terminates in a restricted jet nipple.

The action of the device is very simple; the lower wick lamp is used to heat the upper vessel, causing the spirit to vaporise, and the vapour emerging from the jet nipple is ignited by the flame of the wick lamp, which thus serves as a pilot burner as well as a heater. A certain amount of pressure is developed in the upper vessel, depending upon the amount of applied heat and the restriction of the jet nipple, and the vapour emerges from the latter at high velocity, producing a fierce, roaring jet of flame. Some types of lamps have been provided with a regulator on the wick lamp, to enable the intensity of the vapour flame to be regulated.

This device, altered only in its details and



Gravity-fed vaporising spirit lamp, by the Imperia Co., Ilford

proportions, has been applied quite successfully to firing small boilers, but it is usually desirable to modify its design in some degree. It is, for instance, generally necessary to arrange the vapour jet some distance away from the fuel reservoir, which can quite easily be done, provided that the vapour is not allowed to cool down and recondense. An example of this arrangement is seen in the burner devised by Mr. B. H. Joy some years ago, where the main object was to enable the height of the boiler to be reduced to the minimum. It should be noted that in such cases the heater lamp is not truly a "pilot" burner, nor does it contribute to the heating of the steam boiler.

Other vaporising lamps work on an adaptation of the principle employed in the well-known Fluxite soldering lamp, where both the wick burner and the vapour burner are fed from the same reservoir, which must obviously be vented to atmosphere, and therefore very little pressure is available to force the vapour from the jet. The flame obtained is thus much softer than that of the former type, but may nevertheless be quite efficient, especially if a multiple orifice is used, and the heater burner located in the furnace so that it contributes to the amount of effective heat under the boiler.

A rather interesting type of spirit vaporising lamp, which utilises neither wicks nor pilot burners, has been introduced by the Imperia Co., of Ilford. In this device, the burner itself is virtually a simple bunsen air-gas burner, and vaporisation of the fuel, which is fed to the nipple of the burner by a capillary tube, is effected by conduction from the heater spiral, brazed to the top of the burner tube and more or less in the path of the flames which issue from the jet orifices. The feed is by gravity, a regulating needle valve being fitted to the tank; the lamp can be lit with a match, and can be used in almost any position which enables gravity flow of fuel to be maintained. It gives a soft, silent flame, of considerable volume, and almost perfect combustion of fuel, so that it produces high steaming efficiency with a suitable boiler, such as that illustrated on page 37 July 14th issue.

Lamps working on similar principles have been used in appliances such as spirit-fired flat irons, which once enjoyed a certain degree of popularity but are now practically extinct. The burners have been adapted with some success to use benzoline or petrol, but such fuels usually call for higher pressures and much smaller jet orifices than are necessary for alcohol.

There is scope for much ingenuity in the design of vaporising spirit lamps of all types, but it is not considered worth while to give a lengthy discourse on this particular subject, as the use of alcohol fuel is not very popular among those who seek really high efficiency with model steam plants; it is generally associated with the simple pot boiler and oscillating engine, and it is rather significant that such fuel is rarely used in the steam plants seen at model power boat regattas.

(To be continued)

For the Bookshelf

The Locomotive Exchanges, by Cecil J. Allen. (London: Ian Allen Ltd.) Price 12s. 6d.

Probably the most exciting event in locomotive history was the fairly comprehensive series of exchanges of locomotives, arranged by British Railways last year. Mr. Cecil J. Allen, who has spent more than half a lifetime recording locomotive performance all over the United Kingdom, was fortunate in actually observing the work of most of the competitors during the period of the exchanges, and his book sets down the results of his observations.

But the opportunity has been taken to include as much information as is now available concerning certain exchanges arranged from as far back as 1870 and at intervals up to 1925.

It all makes very interesting reading and, in places, is even exciting; but the fact emerges that no engine can be said to have "won" the contest in 1948, in spite of all kinds of rumours that have circulated since the trials ended, last September. So far as the running is concerned, Mr. Allen's records contain some surprises of which the chief, perhaps, is the comparative dullness and lethargy of the Midland Region "Duchess" class 4-6-2; yet, on one occasion, this type was responsible for the most brilliant performance, and by a substantial margin. So far as the express passenger engines are concerned, the most consistently lively appears to have been the Southern Region "Merchant Navy" class.

Very little information of a technical nature, from which to arrive at a definite conclusion as to the true capabilities of any of the engines, passenger, mixed-traffic and freight, is given, however; we feel that it is from this poiut of view that the book will disappoint some readers. But, as Mr. Allen makes abundantly clear, the trials were undertaken merely with a view to obtaining information which will be of use to the designers and technical staffs who are responsible for the design of future standard types of locomotives for British Railways. Mr. Allen, however, is to be congratulated upon having provided a very comprehensive and interesting account of it all, in non-technical style which can be read, understood and enjoyed by railway enthusiasts of all ages.

IN THE WORKSHOP

by "Duplex"

*43—Gear-cutting in the Lathe

THE description of the methods employed for machining. hardening and marking the gear-cutters was concluded in the previous article, and it now remains to sharpen the teeth to render the cutter ready for use.

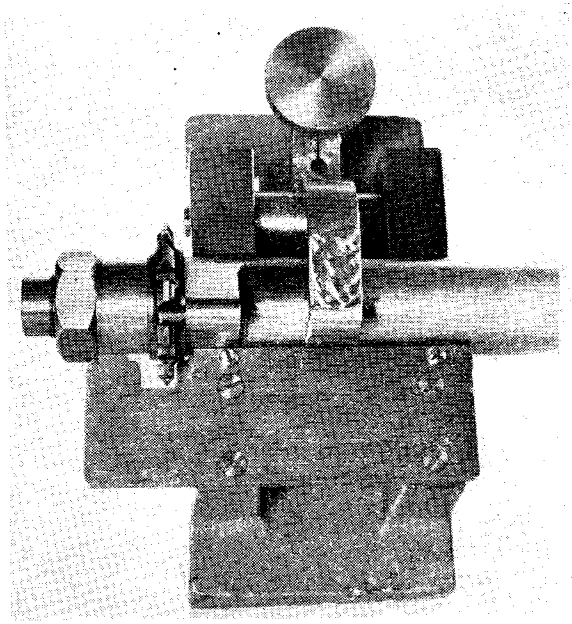


Fig. 36. *The cutter honing jig*

Sharpening the Cutter

The ordinary method of sharpening circular, multi-tooth cutters is to use a grinding machine furnished with an indexing device, in the form of an adjustable stop, which makes contact with the faces of all the teeth in turn; and as the teeth were, in the first instance, accurately spaced by a machining operation, the tooth faces will by this method also be correctly ground.

Those who have no qualms about using their lathes for grinding operations will be able to grind the cutters without difficulty, by using a grinding spindle attached to the saddle, and a device for indexing the teeth of the cutter when the latter is mounted on an arbor carried between the lathe centres.

It will be remembered that, at an earlier stage, the flat faces of the teeth were finished with a fine file, following the sawing operation for cutting out the tooth gaps. This filing process should leave the teeth quite sharp, but as it is a free-hand operation it is advisable to finish the cutting edges by using a more exact method, and one which can be readily repeated should resharpening of the cutter become necessary at some future time.

Accordingly, we have designed a simple form of honing jig for use in the small workshop where a proper cutter grinder is not available.

A Cutter Honing Jig

Although this appliance will sharpen the teeth symmetrically and to a high finish, it is not, of course, capable of removing a large amount of metal; when, therefore, the cutter teeth have become chipped, it may be found necessary either to grind their faces, or to soften the whole cutter and remachine the leading faces of the teeth.

From the view of the jig shown in the photograph, Fig. 36, it will be seen that the cutter is secured in place on its arbor so that the teeth can be indexed by means of the index pin fitted to the arbor web as previously described. The arbor with the cutter in place is clamped in the V-groove in the jig by means of a pivoted arm controlled by a knurled finger-bolt.

The flat table seen in the foreground guides the hone, and is fitted with a fence secured in place by the two round-headed screws seen lying close to the arbor. This fence prevents the edge of the hone coming into contact with the curved surfaces at the base of the teeth, which serve to index the teeth against the register pin; by this means, any damage to these important register surfaces is prevented.

The work of constructing the jig is quite straightforward, and the dimensions and relationship of the parts are shown in the working drawings given in Fig. 37. For the casting forming the base of the jig a Myford saddle V-block was used, as it was found to be of exactly the right construction and very little additional machining was required. The V-block in this case is the larger of the two patterns made by Messrs. Myford.

The dog-legged clamping lever was cut out from a piece of mild-steel bar and then fitted with its knurled setting-screw.

Although the clamping lever is shown in the drawing with a long head, there is no need for it to project more than a short distance beyond the centre-line of the arbor, otherwise it may

**Continued from page* 121, "*M.E.*," *July* 28, 1949.

interfere with the free manipulation of the stone during the honing operation. The pivot pin for the lever is threaded $\frac{1}{4}$ in. B.S.F. at one end, and screwed into the casting, and in addition, spacing collars are fitted on either side of the lever to locate it centrally between the bearing lugs. When fitting these collars, the inner faces of the lugs may be filed flat or machined with a spot-facing cutter, but this refinement of workmanship is in no way essential for the proper working of the clamping lever.

The table should next be fitted and secured in place with four cheese-headed screws, of $\frac{1}{8}$ in, diameter or so, fitted to lie flush with the table surface. It should be noted that, in order to maintain the radial angle of the cutter teeth at the honing operation, the upper surface of the table is made to lie $\frac{1}{16}$ in. below the centre-line of the cutter when mounted in place on its arbor. This may entail reducing the height of the two lugs supporting the table, either by filing or by a machining operation. To machine the lugs, the V-block is clamped to the lathe surface plate and the surplus metal is turned off with a facing tool.

To prevent the hone rocking, as it is moved to and fro across the faces of the teeth, it is important that the surface of the table should be made truly flat.

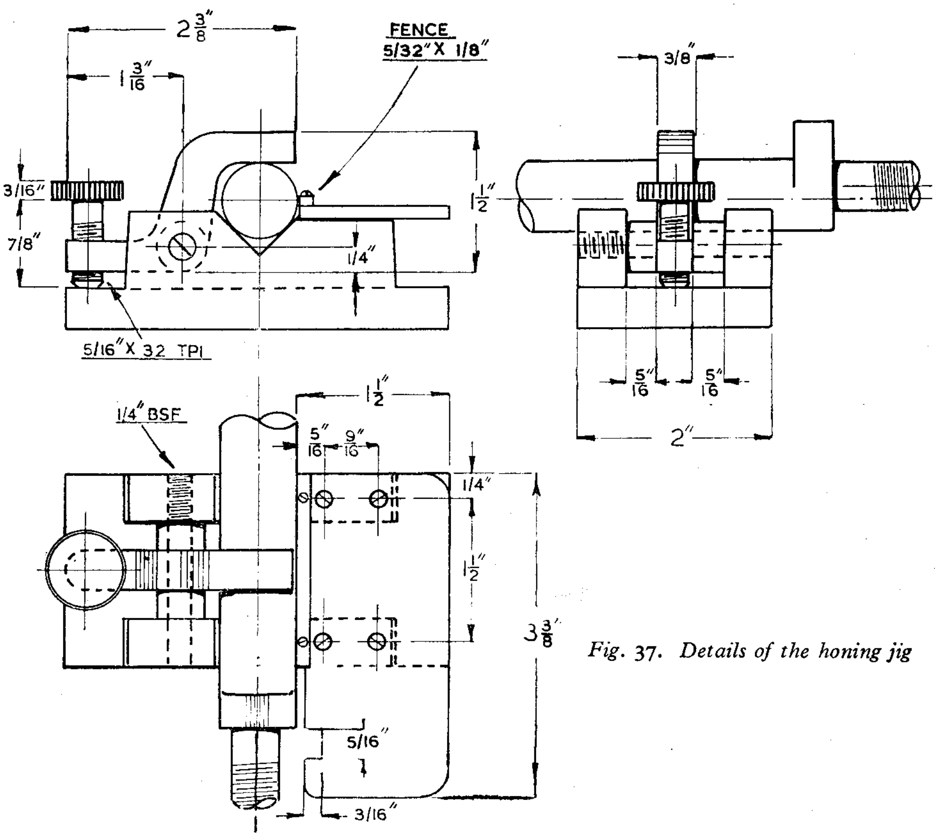


Fig. 37. Details of the honing jig

Nowadays, there appears to be a growing tendency among amateur workers to invoke the aid of a machine to produce flat surfaces wherever they may be required, and although this is often the easiest and quickest way, there are occasions, particularly in the case of thin material, when this is hardly feasible with the ordinary machine equipment found in the small workshop.

It is said that adversity brings out the best in human nature, and certainly financial stringency promotes skill in using hand tools, notably the ability to ply a file correctly and thereby produce flat surfaces.

It will be observed that an ordinary hand or flat file varies in thickness from toe to heel as the flat surfaces belly-out towards the centre of the length of the blade. This property enables the surface of the work to be filed slightly concave, not only in respect of its width, but also in the direction of its long axis, corresponding with the direction of the filing stroke.

When gripping the material for the table, which in this instance is only $\frac{3}{16}$ in. thick, a metal block is placed between the vice jaws to rest on the upper surface of the slide portion of the movable jaw. The height of the block should be such that it supports the work from tipping and, at the same time, allows the material to stand a little above the vice jaws to enable the

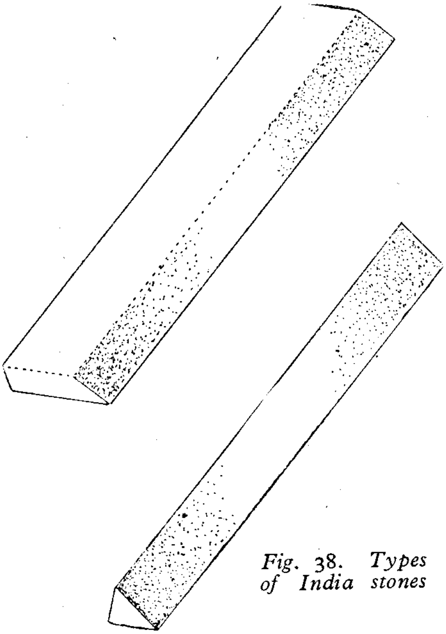


Fig. 38. Types of India stones

file to be used without endangering the surface of the vice.

When the surface of the table has been filed true and its flatness checked with a straight-edge, the centres for the fixing screws are marked-out and drilled ; the holes in the lugs to receive the screws are then drilled with the table clamped in place.

The contour of the gap in the table should next be marked-out and filed to shape, so that, when the cutter is placed in the gap, the arbor can be slid into position and the cutter clamped in place with its securing-nut, as shown in Fig. 36.

It will be observed that the gap is continued towards the left of the table ; this is to allow the cutter to be disengaged from the register peg when the clamp-nut is slackened to bring a fresh tooth into position for honing.

Finally, the fence is fixed in position to confine the contact of the hone to the flat portion of the faces of the cutter teeth.

It will be seen in the drawing that the width of the table is represented as $1\frac{1}{2}$ in., but it will be found that, as only a narrow stone is generally used for the honing operation, a table width of 1 in. will be sufficient.

Using the Honing Jig

To operate the jig, the arbor is rotated to bring the point of one of the cutter teeth close to the edge of the gap cut in the table, and until, with the aid of a rule or straight-edge, the upper face of the tooth is set just proud of the table surface. The arbor is then firmly secured in this position by tightening the knurled finger-screw, and it remains clamped, as set, throughout the honing operation.

When locating the cutter against the register pin, the tooth to be honed is always turned downwards as far as it will go, in order to eliminate the

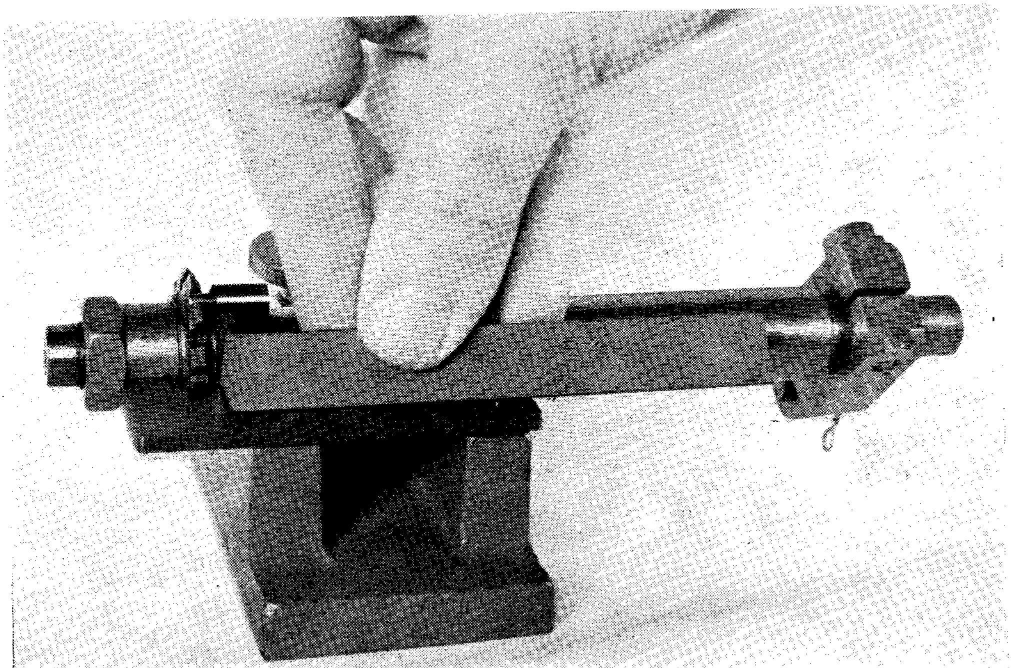


Fig. 39. Sharpening the cutter with the triangular hone

backlash constantly in one direction and so ensure uniformity of setting and sharpening the cutter teeth.

For the actual honing, an India stone will be found to cut quickly and leave a well-finished surface. These artificial stones are made in three grades: coarse, medium and fine; a coarse stone can be used for renovating a damaged cutting edge and a fine stone for finishing, but a single, medium-grade hone will be found satisfactory for ordinary sharpening.

It should be noted that, in order to preserve the correct profile of the cutter teeth, the face of the tooth alone is honed and never the flanks of the teeth.

Driving the Cutter

Where the cutter is mounted on the arbor of the lathe gear-cutting attachment, it is secured in place by means of spacing collars and a clamping-nut, but when the cutter is driven by the lathe mandrel, it is mounted on an arbor carried

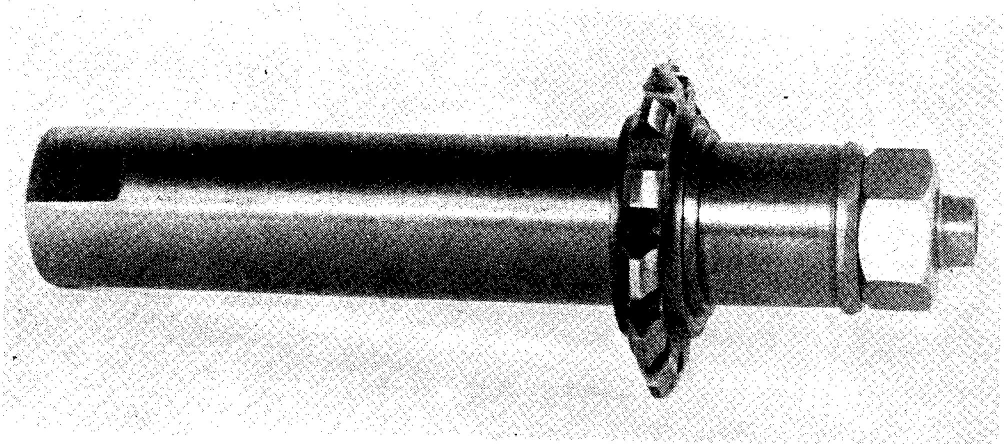


Fig. 40. Cutter arbor for mounting in the chuck

The shapes best adapted for the present purpose are those illustrated in Fig. 38, as the bevelled edge allows the stone to enter as far as the base of the cutter tooth and, at the same time, to keep clear of the tooth above. On the whole, a triangular stone with a $\frac{1}{2}$ in. width of face is preferable, as it affords a good grip for the fingers in the somewhat limited operating space available.

The stone should be treated with thin oil before use to float off the metal dust and prevent it adhering to the abrasive surface; after use, the stone should be wiped clean before being put away.

To carry out the honing, the stone is worked to and fro across the face of the cutter tooth while maintaining light contact with both the guide fence and the table surface.

It will generally be found that, as illustrated in Fig. 39, the stone can be held most conveniently, and operated to the best advantage, if it is held with the tips of the fingers applied to the rear face, and the thumb to the front of the hone.

If the stone is allowed to project rather further to the left than is shown in the photograph, the length of the cutting stroke can be increased accordingly. To reduce wear of the table surface, the cutting pressure should be directed primarily to the vicinity of the cutter tooth rather than against the fence or table. The honing is continued until it is felt that the level of the tooth has been reduced to that of the table; each tooth is then dealt with in succession until all have been correctly sharpened.

either between the lathe centres or in a chuck. In the latter case, a special arbor of the type depicted in Fig. 40 is used.

This is most readily made by turning a length of round, mild-steel mounted between the lathe centres, and both the shank and the seating for the cutter are machined at the same setting to ensure concentricity; the threaded portion can be either screw-cut or formed with a die, and if a thread of 40 t.p.i. is used, the nut previously made for the eccentric cutter arbor will serve as a clamping-nut. After the arbor has been turned and threaded, a flat should be filed at the far end of the shank to afford a secure grip when the arbor is held in the vice to tighten the cutter clamping-nut.

When this short arbor is used to drive the cutter for the gear-cutting operation, it is gripped in the four-jaw chuck, and the cutter is centred by means of the dial test indicator.

For this purpose, the lathe mandrel is turned slowly by hand in the reverse direction and the chuck is adjusted until the reading on the indicator dial becomes constant.

To increase the rigidity when gear-cutting, the tailstock centre should be engaged with the arbor to afford additional support.

It may be found that the gear-cutting operation can be carried out more conveniently if the cutter is positioned further from the lathe headstock than the short arbor permits. In this event, a long arbor of the pattern illustrated in Fig. 41 may be used.

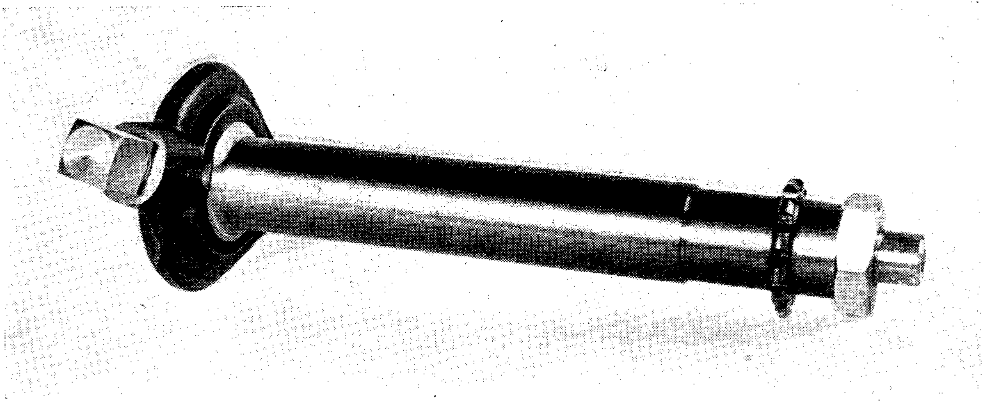


Fig. 41. Cutter arbor for use between centres

As before, the arbor is machined when mounted between the lathe centres, and its end is also threaded to take the clamp-nut belonging to the eccentric cutter arbor. The flat afterwards filed at the further end provides a seating for a lathe carrier, as well as a gripping surface for the vice jaws.

(*To be continued*)

Jubilee of Bassett-Lowke Ltd.

THIS year marks the fiftieth anniversary of the firm which bears a name that is known in every corner of the world where model engineering is practised.

After a somewhat inconspicuous beginning, the firm introduced the "Black Prince" type of low-pressure model steam locomotive, and from then the progress was steadily maintained. The engine mentioned was a great advance upon anything of the kind then available on the ordinary market, and it may be said to have been the first attempt to produce, commercially, a model locomotive that was not expensive but had some resemblance to its prototype. From this point, progress was very rapid and the range of models of this kind was widened. Castings and parts, small steam fittings of many different sorts and sizes became a speciality, and considerable attention was given to the production of a most comprehensive selection of small ships' fittings. All these things achieved much popularity and helped to establish a reputation that has scarcely been equalled by any manufacturer of model parts.

During two wars, Bassett-Lowke's factory at Northampton applied its utmost capacity to the making of important instruments and models for the Government, the Admiralty and the War Office. With the cessation of hostilities, each time, the firm reverted as quickly as possible to its normal productions, and added still more to the range of their goods. High-class exhibition models for the railways, shipping companies, engineering firms, municipal authorities and the like, were built in large numbers, and are to be found in many parts of Britain and abroad.

As is fitting for a jubilee year, Bassett-Lowke Ltd. have, this year, completed and sent to the Cunard Steamship Company's offices in New York, what is probably the finest commercially-produced ship model ever built, the 1/48-scale replica of the liner *Queen Elizabeth*, which was the subject of a special illustrated article in our issue of April 21st, last. The accuracy and finish of this beautiful model have not only set a standard that will be very hard to improve upon, but are a credit to the British modelmaking industry and cannot fail to create a profound impression abroad.

Right from the beginning, the name Bassett-Lowke has figured almost consistently in the advertisement pages of THE MODEL ENGINEER, and the most cordial relations have been steadily maintained between the firm and ourselves. We learn that negotiations are in hand for the building of a fine modern factory in Northampton, and in offering our sincere congratulations upon the attainment of fifty years' service to the model engineering hobby, we extend our best wishes that the negotiations for the new factory will be successful and will lead, eventually, to fresh prosperity to be enjoyed through many years to come.

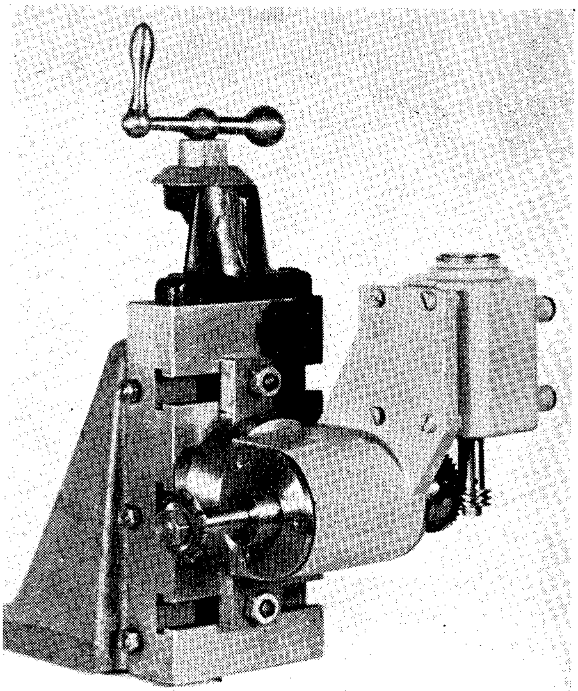
A Motorised Milling Spindle

by R. A. Barker

As mostly all machine tools are motorised today, a motorised milling spindle appealed to me, and on a recent visit to a local "junk stall" several *ex*-R.A.F. 24-V motors were obtained with a view to putting them to use on various lathe attachments, power being supplied through transformer and rectifier, also *ex*-R.A.F. and "junk stall."

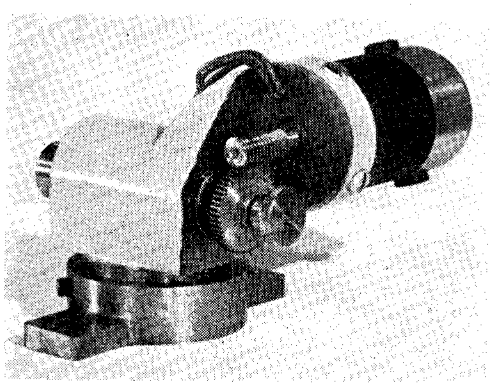
The milling spindle motor was taken from a motorised switch and is mounted on ball-bearings. The spindle, which is 5/32 in. diameter, has a speed of about 4,000 r.p.m.

As can be seen on the photograph, it has a flat face and four small bosses tapped 6-B.A. This face and tapped holes were used as a means of fixing.



A small casting was obtained, having a rectangular flange at one end on which to mount the motor. This casting was bored to take $\frac{1}{2}$ in. diameter ball-races, machined to take the motor, and also the spigot was turned to fit the base, which, in turn, is fitted to the vertical slide. The method of locking the casting in the base was that used by American lathe manufacturers on lathe slide-rests and is quite rigid.

The spindle was made out of a piece of B.M.S. $\frac{3}{4}$ in. diameter and about 3 in. long, turned to fit the ball-races and bored $\frac{3}{8}$ in. diameter to suit a standard taper pin from which the cutter mandrels were made, as they can be bought quite cheaply. Caps are fitted at each end of the casting to locate the spindle, and are held in position by three $\frac{1}{8}$ in. diameter Whit, countersunk screws.



The worm and worm wheel give a 20 to 1 reduction, the wheel having 40 teeth—32 d.p. and the worm is 2-start. An adaptor was made to fit the motor spindle which is only $\frac{1}{2}$ in. long, and on the other end of the adaptor, the worm is fitted.

Having recently obtained 32-40 d.p. cutters, $\frac{3}{4}$ in. diameter, one was fitted to the spindle and a trial was given.

A wheel was cut 32 d.p., cutting the full depth at one cut, and, taken gently, the motor had enough power, although it was possible to stall it. The current taken was $4\frac{1}{2}$ A at 24 V.

Having another motor with a greater speed (9,600) and apparently more power, another spindle housing was made similar to the previous one. This time I thought I would make the spindle to take 8 mm. collets, as mostly all the small end-mills I have up to $\frac{1}{4}$ in. diameter have $\frac{1}{4}$ in. shanks. This spindle, as the previous one, is mounted on ball-bearings and is provided with a draw-in spindle for collets. The main casting, as seen by the photo, was not altogether a simple one to machine, as it was an awkward shape. The motor, which is circular, drops into a recess in the casting. This was bored by holding it in a vertical slide with the cutter-bar in the chuck. The reduction gear is single-start worm, $\frac{3}{8}$ in. diameter and 48-tooth worm wheel, which were attached to the motor when purchased.

These motors, I believe, were aircraft camera motors and are of American manufacture.

On completion, the spindle was tried out and gave a slightly better result than the first, although both spindles can do the job they were made for, which is cutting clock gears.